

HOW CONTEXT AFFECTS  
UNCERTAINTY DISCLOSURE  
AND COMMUNICATION IN  
ENVIRONMENTAL IMPACT ASSESSMENT:  
A CASE STUDY OF ENERGY  
DEVELOPMENT IN  
NORTHERN ALBERTA

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## ABSTRACT

This study investigates practices of uncertainty consideration, avoidance, and disclosure in Canadian environmental assessment (EA), namely within the context of social, political, economic, and/or environmental project conditions surrounding the Joslyn North Oil Sands Mine development project in northeastern Alberta. Since EA is used to predict future impacts, some uncertainty is inherent and unavoidable; however, uncertainty is not always considered or communicated. To investigate how contextual dynamics influence uncertainty consideration and acknowledgement in Canadian EA, stakeholder views on were explored using semi-structured interviews. Nineteen interviews were performed with key project informants including practitioners, reviewers, panel members, interveners, and consultants.

Results indicate there are significant uncertainties about the project emanating from both the environmental impact statement and wider regulatory process. Factors contributing to uncertainty specific to the ‘internal’ EA process include: varying perspectives among those involved in the EA; language used in the assessment and the dissemination of information; use of professional judgment in lieu of sufficient data; the lack of complete baseline data, and unclear terms of reference. Aspects of the assessment that people were most uncertain about were: cumulative effects assessment; species at risk; critical habitat; and setback distances (i.e., wildlife buffers) and corridors around the Ells River Valley. ‘External’ factors contributing to uncertainties in the Joslyn North mine case include a generally low level of confidence in the Alberta EA approval system; deficiency of integrating TEK in assessments; policy limitations (i.e., jurisdictional restrictions for reviewer inquiry); the absence of measurable thresholds and criteria in monitoring and mitigation plans; and concerns about the relationship among the federal and provincial regulating bodies and industry.

Contextual factors such as the dynamics of the stakeholder relationships (i.e., change in project operators) heavily influenced uncertainty disclosure, consideration, and avoidance practices in the Joslyn North case. Research yielded that much of the uncertainty was indeed disclosed, but at times downplayed, and addressing or truly considering uncertainties was avoided so projects appear to be socially, environmentally and politically palatable. Recommendations to improve uncertainty communication are provided to support better decision-making in EA. These include the following: developing a common understanding of the main project uncertainties within the realm of the EA system, and therefore able to be influenced through the EA process; creating and using measurable criteria to better prioritize uncertainties; bringing uncertainty communication to the forefront of the EA and regulatory process dialogues; and working toward closing information and knowledge gaps by pinpointing major and/or commonly held uncertainties and tackling these before addressing other uncertainties. An idea presenting the *locus of uncertainty* to help address internal sources of uncertainty within EA stakeholder influence is presented.

**Key Words:** Alberta; communication; energy development; environmental assessment (EA); oil sands; risk; species at risk; uncertainty

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## **ABBREVIATIONS**

AENV	Alberta Environment
AEPEA	Alberta Environmental Protection and Enhancement Act
AER	Alberta Energy Regulator
AESRD	Alberta Environment and Sustainable Resource Development
AOS	Athabasca Oil Sands
BIA	Biodiversity Impact Assessment
CEMA	Cumulative Environmental Management Association
CEAA	Canadian Environmental Assessment Agency
CEAA	Canadian Environmental Assessment Act 1995
CEAA 2012	Canadian Environmental Assessment Act 2012
CNRL	Canadian Natural Resources Limited
DCEL	Deer Creek Energy Limited
EA	Environmental Assessment
EAB	Environmental Appeals Board
EARP	Environmental Assessment and Review Process
EC	Environment Canada
EIS	Environmental Impact Statement
ERCB	Energy Resources Conservation Board
GHG	Greenhouse Gas emissions
GRI	Global Reporting Initiative
HIA	Health Impact Assessment
HIS	Habitat Suitability Index
IBA	Impact Benefit Agreement

LARP	Lower Athabasca Regional Plan
NGO	A Non-governmental Organization
RAMP	Regional Aquatics Monitoring Program
RSEA	Regional Strategic Environmental Assessment
SARA	Species at Risk Act 2002
SAGD	Steam Assisted Gravity Drainage
SEA	strategic environmental assessment
SIA	Social Impact Assessment
SIR	Supplementary Information Requests
SRD	Sustainable Resource Development
SSHRC	Social Science and Humanities Research Council
TIA	Territorial Impact Assessment
TEPCA	Total E&P Canada
TEK	Traditional Ecological Knowledge
TK	Traditional Knowledge

## Chapter One

### Introduction

*...uncertainty that is not shared by all participants can lead to significant inefficiencies. Situations in which some people know things that others do not are said to involve asymmetric information, and these situations give rise to two problems, adverse selection and moral hazard...Moral hazard occurs whenever the consequences of a contract are affected by hidden actions or hidden information... (Leach 2004: 293–294).*

#### 1.1 RESEARCH PROBLEM

This research investigates practices of uncertainty disclosure, consideration, and avoidance behaviour in Canadian environmental assessment (EA) within the context of social, political, economic and/or environmental project conditions. Environmental impact assessment is a decision-making tool that is used to identify, predict, and evaluate, possible environmental impacts of proposed developments (Beattie, 1995; Cashmore, 2004). Worldwide, it is generally considered to be a successful tool due to its flexibility, rigour, and blending of numerous scientific disciplines, allowing for a holistic view of the environment and the impacts of development (Cashmore, 2004). However, recent reviews of EA performance have shown that the predictions at the heart of the process are often wrong, and that there is uncertainty and a lack of transparency surrounding decision-making and approvals processes (Tennøy et al., 2006; G. Wood, 2008). A decision-maker should be informed about, and appreciate, the range of uncertainties that exist when making a decision in EA (*Environmental Decisions in the Face of Uncertainty*, 2013). Therefore, the need for better understanding of the uncertainties embedded in EA is paramount for the process to mature and succeed.

Environmental impact assessment provides decision-makers with scientific information and analysis (Cashmore et al., 2007) about proposed developments. Its application has become so widespread over the past 40 years that it is considered a key element in environmental management

(Bailey, 1997; Morgan, 2012). Recently, Global EA practice (including SIA) has undergone many changes as a result of new integrated approaches to assessing impacts and new modes of environmental governance (Cashmore, Bond, & Sadler, 2009).

In Canada, the new *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) is of major concern of concern due to the changes it implements (Mantyka-Pringle et al., 2015)<sup>1</sup>. The *Canadian Environmental Assessment Act 2012*, aims to streamline environmental impact assessment by eliminating most federal government involvement in environmental impact assessment, and so, limits the scope of the effectiveness that the federal jurisdiction now has (Gibson, 2012). The new legislation mandates that some of the assessment obligations will be placed in the provincial and territorial jurisdiction (Gibson, 2012). The federal government passed the law to ensure more timely assessments communicating mostly on provincial assessments (Gibson, 2012). But, the new act is not designed to ensure comprehensive attention to environment considerations (Gibson, 2012). For example, some recent legislative changes include the new CEAA 2012 which plainly addresses the interests of Aboriginal Peoples as a federal responsibility, but significantly reduces the opportunity for public participation in EA by Aboriginal Peoples and other interest groups and stakeholders (Bond et al., 2014). These changes have led to some speculation that environmental legislation has only been altered in order to “facilitate more rapid expansion of the fossil fuel industry” (Mantyka-Pringle et al., 2015: 800). Other significant changes to the legislation include alterations to important federal legislation (i.e., the Fisheries Act and the Species at Risk Act) (Mantyka-Pringle et al., 2015).

Many decisions in environmental management are made without giving uncertainty enough consideration (Harremoës, 2003). Environmental decision-making is extremely dynamic due the complex nature of natural systems and the competing interests of stakeholders (Maier et al., 2008). It is beneficial to reflect on how best to address uncertainties in the EA process as the potential environmental impacts from uncertain decision-making can be enormous (Wardekker et al., 2008).

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<sup>1</sup> The Joslyn North mine was assessed under CEAA 1995. It is still beneficial to note a few of the major differences between CEAA 1995 and CEAA 2012. The primary reason for enacting CEAA 2012 was to alleviate perceived time and resource constraints on development approvals (Bond et al. 2014). Subsequently, a new screening process was introduced whereby proponents complete and defend a project prior to the start of a project-based EIA, effectively excluding public participation from early planning (Bond et al. 2014; Gibson 2012). This change introduces a significant amount of pressure on the relevant authority to determine whether a project- EIA will be conducted. The former CEAA 1995 was based on “triggers” (Bond et al. 2014: 48), which means that almost all projects were included in the requirement for screening and were subject to some type of EIA (Bond et al. 2014).

For example, Tennøy (2008) stated that some consequences of prediction uncertainty are that effective and efficient follow-up is hard to set, inappropriate mitigation measures may be applied, and unwanted and unmitigated environmental damage may occur.

Currently in EA, responsibility to provide much of the environmental information used in the process rests with the project proponent who can exercise a certain degree of control over what knowledge of uncertainties will or will not be passed on to decision-makers (Wood, 2008), while still meeting minimum regulatory standards. Increasingly, the passing of information along to decision-makers, who are then required to make decisions based on ‘sound’ analyses of potential environmental impacts, is portrayed as a ‘means to an end’ (Cashmore et al., 2007), meaning that it is useful in achieving an end goal, in most cases, development. Moreover, the information that *is* passed on to practitioners and decision-makers is generally fragmented and not systemized (Sigel et al., 2010). It is common for proponents to view EA primarily as a technical and economic barrier to their pending projects (Bond & Pope, 2012). Perhaps relatedly, (Cashmore & Axelsson, 2013; Jalava et al., 2013) note a lack of information being forwarded by the most powerful players engaged in the EA discourse (i.e. the proponents), and this may lead decision-makers to act without proper consideration of either the uncertainties or quality (i.e., no use of formal uncertainty analysis when making decisions) or the “goodness” of the information (Reckhow, 1994).

The outcomes in the practice of EA are more for the appeasement of influential stakeholders (i.e., local councillors, public planners, and local politicians) than anything else, and appeasement is achieved by creating a public perception of having done ‘due diligence’ (Cashmore et al., 2007). A number of authors suggest EA is in danger of becoming a tool that is merely used as a means of obtaining project approval (Fainveather, 1994; Gibson, 2012; Wood et al., 2000). However, with advances in communication (Cashmore, 2004) and transparency (particularly regarding uncertainty), EA can be improved (Bond & Pope, 2012). Decision-makers need to be supplied with the most useful information available about the potential impacts that a project could have on the environment (Leknes, 2001), and arguably, information about uncertainties is crucial.

### *1.2 Research Rationale*

If EA is to continue to function as a sound decision-making support tool, decision-makers must explicitly consider uncertainty when making decisions (Reckhow, 1994). This means proponents must readily acknowledge it and communicate it, whether or not it is being eagerly

communicated, or keenly received in communications between practitioners and stakeholders (Rabinovich & Morton, 2012). In a study of uncertainty in the EA prediction processes, Tennøy et al. (2006) found that out of their 22 Norwegian cases, uncertainty was neither mentioned in 59% of the environmental impact statements (EISs) nor in 58% of related decision documents (that contain explanations about project approval or disapproval). Since EA has the potential to change the views of those engaged within its processes (Bond & Pope, 2012; Duncan, 1972), there is a need to consider uncertainty at all stages of the decision-making process, so that decisions can be made with more confidence or known certainty (Maier et al., 2008).

Research must be expanded to examine individual differences regarding both the perception of uncertainty, and the complexity and dynamics of the decision-maker's environment, as EA is not seen as just a tool for influencing and informing decision-makers, but as a process that can change the views of stakeholders who engage with EA (Bond & Pope, 2012; Duncan, 1972). Issues related to uncertainty in EA processes have received increased attention since the mid-1980s (Lemons, 1996), but there has been no research on the contextual dynamics of uncertainty consideration and acknowledgement among practitioners and decision-makers. There also has been no research on the extent to which assumptions and data limitations are communicated by the project proponent's impact statement (Beattie, 1995; Tennøy et al., 2006). There are many major resource development projects looming in Canada and uncertainties about their impacts should be clearly communicated and understood so that measures to prevent environmental degradation can be applied. This would also result in a higher degree of confidence in the decisions that are taken.

### *1.3 Research Purpose and Objectives*

The purpose of this study is to investigate practices of uncertainty disclosure, consideration and avoidance and in Canadian EA within the context of social, political, economic and/or environmental project conditions. The research will examine perceptions of uncertainty among those involved in EA practice, and the complexity and dynamics of the decision-maker's environment. Listed below are the specific objectives of this research:

1. To document uncertainty disclosure, consideration, and avoidance behaviour practices within the context of a single project-based environmental impact assessment;

2. To investigate how contextual factors for project development (environmental, social, political, administrative) may or may not have contributed to uncertainty disclosure, consideration, and avoidance practices; and
3. To develop recommendations about how uncertainty can be more readily acknowledged, considered and communicated in EA practice and decision-making.

The Joslyn North Oil Sands Mine development project in northeastern Alberta is the case investigated in this thesis. The Joslyn North Mine is a recent project, having initially been proposed in 2008, and very relevant as it demonstrates the dynamic nature and environment of EA, which bring together multi-levels of government, public citizens, Aboriginals, industry, NGOs and consultants. Understanding how uncertainty is handled in EA for a project like the Joslyn North Mine is applicable not only on a regional or provincial level, it is also relevant on a national and international levels. Joslyn North Mine is a dynamic case involving many stakeholders with diverse perspectives, and there are many topics of concern that involve scientific, process, and contextual uncertainties.

This research is part of a larger Social Science and Humanities Research Council (SSHRC) funded initiative developed to advance the theoretical understanding and explanation of uncertainty in EA; to bring uncertainty communication to the forefront of practice; and to propose practical solutions to improve uncertainty assimilation, communication, and transparency. The larger study has three phases: 1) a cross-Canada assessment of uncertainty consideration in EA practice and decision-making; 2) three case studies to explain the contextual dynamics of uncertainty disclosure, consideration, influence, and understanding in EA and how uncertainties are perceived by and communicated about among practitioners, proponents, decision-makers and affected interest groups; and 3) workshops to develop guidance for practitioners and decision-makers on how to better address uncertainties in EA. This research is part of phase 2 and is closely examining the EA process for TEPCA's Joslyn North Mine project. The overall intent of the Joslyn North Oil Sands Mine case investigation is to advance and improve understanding of uncertainty consideration and communication to help prevent environmental degradation during imminent energy development projects.



#### *1.4 Thesis Organization*

This thesis adopts a traditional thesis format. Following the introduction is a literature review (Chapter Two), which explains the current state of knowledge on uncertainty communication and consideration in EA and reviews the approaches that are now in use to help manage uncertainty. The literature review also identifies the gaps in knowledge that justify the present research. Next, Chapter Three presents the study design. A detailed description of the Joslyn North Mine project is given, as well as the research methodology. Chapter Four reports the results of the investigation, while Chapter Five discusses key findings emerging from the results. Chapter Six draws conclusions for the study and presents a list of recommendations about how uncertainty can be more readily acknowledged, considered, and communicated in EA practice and decision-making.

## **Chapter Two**

### **Literature Review**

Chapter two begins by briefly describing the progression of EA, the state of knowledge on uncertainty communication and consideration in EA, and the theoretical approaches currently used to help manage uncertainty in EA. Next, some of the current research being completed in the Alberta oil sands is discussed, followed by the gaps in knowledge outlining the necessity of this research on uncertainty communication in Canadian EA, and the oil sands region specifically.

#### **2.1 RESEARCH PROGRESS REGARDING UNCERTAINTY IN EA**

##### ***2.1.1 EA Evolution***

Environmental assessment has been a key component of environmental management over the past 40 years (Morgan et al., 2012). Internationally, EA has gained momentum in the past 20 years with rising recognition of the problems associated with large-scale development projects such as oil/tar sands mines (i.e., resulting in loss of biodiversity, threats to freshwater sources and water quality, climate change concerns, societal and cultural issues and so on (Morgan et al., 2012). Stemming from the increased adoption of EA, SIA strongly developed in the late 1970s because EA was deemed to have strong emphasis on biophysical components and often marginalized the analysis of social dynamics (Dendena & Corsi, 2015). The Canadian federal government began its EA program under the Environmental Assessment and Review Process (EARP) in 1973, and in 1995 the Canadian Environmental Assessment Act was proclaimed and the Canadian Environmental Assessment Agency was established (CEAA) (Ohsawa & Duinker, 2014).

Since its inception, and as its popularity grew, EA branched off into dozens of specialized forms of assessment (Morgan, 2012; Lawrence, 2013; Morrison-Saunders & Bailey, 2003). For example, there is now strategic environmental assessment (SEA) (Kornov & Thissen, 2000), including regional strategic environmental assessment (RSEA) (see Gunn & Noble, 2009; Sheate & Partidário, 2010); health impact assessment (HIA) (see J. Kemm, 2005; John Kemm, 2008; Bhatia & Wernham, 2009) biodiversity impact assessment (BEA) (see Geneletti et al., 2003; Sherrington, 2005; Söderman, 2005); territorial impact assessment (TIA) (see Lawrence 2013); and so on. Many specialized types of EA focus on the quantitative side of uncertainty, and the qualitative dimensions of decision-making at the science and policy interface is often ignored (Maxim & van der Sluijs, 2011). Uncertainty assessment should aim to bring scientific predictions increasingly closer to reality, so that affected parties can quantify and reduce uncertainty as much as possible to minimize the effect uncertainties will have on outcomes (Maxim & van der Sluijs, 2011). Within the range of environmental management tools EA is an ideal framework to use when uncertainties and possible environmental risks require close attention (Lawrence, 2013; Jalava et al., 2013).

#### *2.1.2 State of Uncertainty Research in EA and Impact Prediction*

Uncertainty is a fact of life, and usually significantly limits the degree to which science can provide objective, reliable knowledge (Wardekker et al., 2008). As EA is used as a tool to predict future outcomes, there is a particular need to improve uncertainty communication in the prediction phase of EA (Tennøy et al., 2006). Indeed, the vast majority of EA research on uncertainty—about 90% of the studies—could be categorized as research addressing uncertainty in the impact prediction (e.g., Dipper et al., 1998; Glasson, 2008; Peche & Rodríguez, 2011; Leung et al., 2015). Research focused on uncertainty communication, disclosure, and decision-making under uncertain conditions account for about 9% of published papers on this topic (Leung et al., 2015). Those papers tend to be more recent with a consistent message that uncertainty needs to be better communicated and that practitioners need to be more explicit about stating their assumptions and predictions (Leung et al., 2015)

Limited progress has been made in the ability to predict the magnitude of impacts (Kemm, 2005). Accuracy of impact prediction is essential, and accordingly, the uncertainty associated with impact predictions demands consideration (Wood, 2008). The EA process demands that impacts

are predicted even though it is understood that the future is uncertain (Noble, 2010), yet several studies prove that impacts often appear much more certain than they are (Buckley, 1991; Glasson, 2008; Tennøy et al., 2006). Environmental assessments look to the future and predict a set of impacts, but those forecasts are almost never compared with actual impacts (Beattie, 1995). A study completed by Söderman (2005) reported that in 38 audited Finnish EA reports, one of the most severe shortcomings was impact prediction. Similarly, Buckley (1991) concluded that in Australia, impact predictions were less than 50% accurate. These results are in accordance with various international studies, which verified that predictive impact processes/methods need improvement (Buckley, 1991; Kemm, 2005; King & O'Malley, 2012; Petticrew et al., 2007).

Prediction problems appear to be most pronounced when dealing with predictions of one-time events where estimated probability springs from less than complete confidence in the predictive models (Wardekker et al., 2008). Some research has focused on the development or use of specific methods for tackling uncertainty by improving impact predictions (Dipper et al., 1998; Glasson, 2008). For example, Peche and Rodríguez (2011) used a case study to demonstrate a sophisticated methodology termed 'fuzzy logic' to aid in addressing uncertainty. Liu and Lai (2009) proposed an integrated decision-support framework that combines fuzzy logic and network analysis to strengthen the prediction process. A less mathematical approach is proposed by Dipper et al. (1998), who outline the need for follow-up analysis in order to learn from past experiences thereby improving prediction (Bailey, 1997; Wood et al., 2000). If using these methods of follow-up to learn from past experiences would improve the accuracy of impact prediction, uncertainties could be more confidently communicated throughout the EA process since there could potentially be more information about past shortcomings/failures and successes. Bond et al. (2015) proposed that uncertainty could be better managed through embedding an evolutionary resilience approach (i.e., assessment should focus on effects that cannot be predicted), which would be supported through participatory deliberation and adaptive management practices.

Currently, EA lacks effective follow-up. This gap makes it difficult to understand if the predicted impacts actually ensue, to respond to unpredicted impacts, to learn from experience, to take advantage of unexpected opportunities that may arise to enhance environmental management, and to manage risk and uncertainty involved in predicting future impacts of anthropogenic activities on complex environmental and social systems (Noble, 2000; Morrison-Saunders et al.,

2003; Cashmore et al., 2004; Noble & Storey, 2005; O’Faircheallaigh, 2006; Lawrence, 2013). Environmental governance bodies, academics, and practitioners involved in major projects have increasingly called for environmental monitoring and follow-up activities, yet these activities still remain the weakest stage of EA practice (Morrison-Saunders et al., 2003; O’Faircheallaigh, 2006).

### *2.1.3 Stakeholder Participation and Uncertainty Disclosure in EA*

Public participation is a key component of EA. It is required by governments around the world through EA legislation, and is emphasized by professionals and academics as a standard of good practice (Wiklund, 2011). Wiklund (2011) argued that there is disagreement regarding the appropriate design and implementation of public participation schemes in EA, i.e., participation is limited, taking place too late in the process after the proponent has defined the project and narrowed the list of potential alternatives to the favoured project design (Hunsberger et al., 2005; Wiklund, 2011). For example, under Canadian EA legislation, citizens have to prove that they are directly affected by a proposed development before they are allowed to participate (Hunsberger et al., 2005). There is a push for proponents and government representatives to engage with the literature about public participation in EA to produce more credible EAs. Greater credibility is needed as there are cultural constructs on the part of regulators, consultants, and policy makers that result in blind spots: a big source of uncertainty because they are unacknowledged (Howitt, 1995)

For many laypeople, uncertainty conversations are often difficult to understand and explain (Heidmann & Milde, 2013). Heidmann & Milde (2013) have suggested that it may be important for those laypersons to be able to understand scientific innovations and information in order to meaningfully engage in controversial scientific issues, and so they have encouraged discussions about scientific uncertainty. In fact, Hunsberger et al. (2005) found that information in plain language about EA is not available in all jurisdictions. At times, it has been claimed that the public in general do not have the knowledge or interest required for effective participation in EA (Wiklund, 2011), and the academic community has provided only very little practical guidance on how to best help practitioners properly disclose uncertainties and the effectiveness of their mitigation measures (Leung et al. 2015). Heidmann and Milde (2013: 8) stated that “there has been no effective dialogue about scientific uncertainty in environmental research with the public thus far.”

## 2.2 THE NECESSITY OF UNCERTAINTY COMMUNICATION AND DISCLOSURE IN DECISION-MAKING

### 2.2.1 *Complexity of Uncertainty Communication*

Environmental assessment is a process that involves numerous inter-related decisions many of which are sizeable, and are made collectively and iteratively, and this can cause uncertainty in the process (Retief et al., 2013). In EA, many authority figures act not only on behalf of themselves but also on behalf of the broader community and a range of stakeholders (Retief et al., 2013). The development options (i.e., design of the project and its alternatives) considered in EA in practice are often designed for the appeasement of influential stakeholders by creating a perception of due diligence (Cashmore et al., 2007). In this way, EA has slowly become divorced from being a rational decision-making tool, to merely being a means of obtaining project approval (Fainveather, 1994; Gibson, 2012; Wood et al., 2000). It has failed to reach its full potential (Noble, 2010; Bond and Pope, 2012; Jalava et al., 2013) but with advances in practice, communication (Cashmore, 2004), and transparency (particularly regarding uncertainty) EA can be improved (Bond & Pope, 2012).

Much research has suggested that a focus on better impact predictions in EA will aid in uncertainty communication (Morgan, 2012). For example, Reckhow (1994) emphasizes that decisions made in EA do not explicitly take into account uncertainties, and that consideration and communication of uncertainties will lead to better-informed decisions. Tennøy (2008) agrees stating that “uncertainty is almost unavoidable in EA predictions, and that better communication about uncertainty and a more transparent prediction process may improve EA as a decision-making tool.” Fortunately, there is an increasing awareness for the importance in evaluating uncertainty in developing policy in the discipline of environmental science (Maxim and van der Sluijs, 2011), and in EA.

The EA process, including the federal and provincial public hearing process, should serve as a tool to paint a clearer picture of proposed development plans (Jalava et al., 2013), featuring uncertainty information in the main text of documents as often as possible, making it visible to policymakers and decision-makers (Wardekker et al., 2008). When completing an EA there should be careful consideration about where to disclose uncertainty in the assessment as it should be

explicitly disclosed to the relevant audience (Wardekker et al., 2008). However, Söderman (2005) established that in Finland, developers are unwilling to present any gaps or limitations in their data analysis making it impossible for decision-makers to make informed decisions with uncertainty in mind. Others attempting to encourage communication of uncertainties have reported similar findings of poor uncertainty consideration and disclosure (Shackley & Wynne, 1996; Wynne, 1992).

### *2.2.2 Uncertainty in Decision-Making in EA*

To accomplish improved decision-making, practitioners need to consider, appreciate, and minimize uncertainties (and their various dimensions) within the EA process (Lemons, 1996; Walker et al., 2003). Maxim and van der Sluijs (2011) found that much of the uncertainty analysis that is completed does not adequately inform decision-making processes at all. Better reflection on possible implications of uncertainties could provide decision-makers with perspectives on how to deal with uncertainties (Wardekker et al., 2008).

Wood et al. (2008) argue that responsibility for most of the appropriate information falls to the proponent, and this can lead to a major distortion of information. Ignoring uncertainty can have far-reaching effects such as creating public distrust in the science supporting policy, and/or influencing policy-making in a negative fashion by contributing to poorly informed decisions with potentially significant long-term environmental consequences (Maxim and van der Sluijs, 2011; see also Wardekker et al., 2008). There has been some informative research on the need to better communicate uncertainties in EA decision-making and the implications of non-disclosure practices (see Tennøy et al., 2006; Wardekker et al., 2008; Duncan, 2013; Leung et al., 2015). For example, Tennøy et al. (2006) found that decision-makers are often not made aware of uncertainty that exists in the assessment, and an increasing number of authors argue that decision-making in EA is not even rational (Bond et al., 2015). In fact, much of the research on uncertainty communication and decision-making has been based on the notion that increasing knowledge about uncertainty will allow decision-makers to make more solid decisions (Geneletti et al., 2003).

## 2.3 SOURCES OF UNCERTAINTY

The nature of uncertainty is broad: in how it is defined, where it is found, and in terms of its sources – such as inherent variability or incomplete knowledge (Walker, 2003; Leung et al., 2015). Many fields of study have various definitions and classifications of uncertainty and it can be defined from many different perspectives (Maxim and van der Sluijs, 2011; Heidmann and Milde, 2013; Leung et al., 2015). Walker et al. (2003) define uncertainty as “any deviation from the unachievable ideal of completely deterministic knowledge of the relevant system.” Maxim and van der Sluijs (2011) list the most frequently discussed sources of uncertainty as (1) lack of knowledge (i.e., simplification, complexity of the world, measurement etc.) (see Rowe, 1994 ;Wu & Li 2006) and (2) variability (i.e., inherent randomness of the natural world) (see Rowe, 1994); (3) expert subjectivity (i.e., mathematical models) (see Walker et al. 2003); and (4) communication patterns (i.e., uncertainty in content) (Levin & Cross, 2004). After reviewing many of the different typologies and definitions of the sources of uncertainty Maxim and van der Sluijs (2011) found that there is no commonly shared typology of uncertainty. However, uncertainty has to be distinguished from “risk” which indicates alternatives where probabilities are known (Gabbert et al., 2010:133). Heap et al., (1992: 349) describe the differences between risk and uncertainty, whereas uncertainty is a type of “not knowing” which is associated with risk where an individual does not know the outcomes with certainty but “can attached probabilities to each of the possible outcomes.”

Exploring potential impacts of future developments by managing the probability of a uncertain negative outcome is possible, rather than trying to negate the outcome completely (Van Asselt & Rotmans, 1996), for example in the modeling phase. In this way, considering uncertainty by expressing it more in terms of risk is a possibility, as risk indicates known probabilities of outcomes (Van Asselt & Rotmans, 1996). Moreover, awareness is growing that uncertainty may have important implications for risk management, as uncertainty within the risk assessment process can have major implications on management decisions (Ragas et al., 2009).

Knowing about uncertainties, their kinds, sources, and consequences, helps in assessing the adequacy and reliability of available data and enables better decision-making under uncertainty (Heidmann & Milde, 2013). Sigel et al. (2010) argue that knowing where the sources of uncertainty lie is helpful for making an initial description of uncertainty and for localizing uncertainty within



the decision-making process. Therefore, much research has been done to understand sources of uncertainty (e.g. models, scenarios, worldviews, values, assumptions, measurement error, type of data, attitudes of decision-maker, etc.) in order to incorporate them into the decision-making process (*Environmental Decisions in the Face of Uncertainty*, 2013; Maier et al., 2008; Sigel et al., 2010; Wardekker et al., 2008).

Wardekker et al. (2008) studied several issues concerning the presentation and analysis of uncertainty information and communication. Participants of this study viewed uncertainty as an important aspect of policy-making and express that it should be prioritized; transparency was also deemed highly important (Wardekker et al., 2008). Wardekker et al. (2008) also emphasized that policy advisors are in fact interested in the various sources of uncertainty such as modeling-uncertainty and scenario-uncertainty. Maier et al. (2008) identified sources of uncertainties in data to include the following: measurement error (i.e., measurement precision with the type of instrument used); type of data recorded (i.e., not all relevant data are recorded); length of data record (i.e., will have an impact on the types of events that have been captured, and therefore can have significant effects on the decisions made using the data); and the way the data are analyzed, processed, and presented. The study determined that uncertainty associated with human input (i.e., human decision-making processes, subjective and non-quantitative factors and so on) has received limited attention in the literature.

Maier et al. (2008) discovered that, traditionally, the focus of research on uncertainty in EA has been on uncertainty within data and environmental models. Data is used extensively in the environmental decision-making process and models usually play an important role at a number of stages (Maier et al., 2008). Models are used to gain a better understanding of complex systems or for predicting/forecasting effects (Walker et al., 2003). When it comes to prediction in EA, there is great complexity with the issues that EA models are trying to address and within the models themselves (Gabbert et al., 2010). Due to the complexities, many EA models are subject to different types and sources of uncertainties, often due to measurement errors and/or natural variability (Maier et al., 2008). Accordingly, uncertainty in EA models has received much attention (Gabbert et al., 2010). Given an incomplete understanding in how natural systems work and behave, there will always be an undeniable degree of uncertainty as to whether the models being used can fully represent the structure of the system (Patt & Dessai, 2005). As Gabbert et al. (2010: 132-133) state,

“models are just a cut-out of reality, and as a consequence they suffer from imperfections in many ways causing model inputs to vary.”

Models are typically used to help develop the information provided in an EIS as they allow for proponents to present information about predictions and future outcomes with some clarity, yet there are a number of issues associated with them, including the misinterpretation of numbers (Duncan, 2008). In a politically charged arena such as EA, misuse or misinterpretation of numbers can be detrimental (Duncan, 2008). Geneletti et al. (2003) found that if difficulties and uncertainties are made explicit at the start of the EA process, it greatly eases the decision-making process, resulting in more informed decisions, fewer arguments, and the formulation of mitigation plans for possible problems that might arise. Maier et al. (2008) emphasize the usefulness of integrated models, algorithms, and multi-criteria decision-analysis as a means of improving the quality of decisions. These methods can assess a response of an environmental system to proposed options by using model simulations that explore impacts in response to different scenarios (Maier et al., 2008). For example, robust decision-making (RDM) is a model that has been known to mitigate deep uncertainty (Maier et al., 2008). Deep uncertainty is defined as “as the condition of being unable to construct a single satisfactory model describing an environmental decision-making situation, regardless of the manner in which parameter uncertainty is handled” (Maier et al., 2008:70). As models become more complex, there is a greater need to identify environmental uncertainties within the natural systems so that management options can be identified with more confidence (Maier et al., 2008).

## 2.4 TYPES OF UNCERTAINTY

Though there has been much research done to understand the reasons for, and sources of uncertainty, the recognition of it within EA can be difficult as there is no commonly shared terminology or agreed upon typology of uncertainty (e.g. arrange the different definitions of uncertainty into groups according to similarities) (Morgan et al., 2012; Walker et al., 2003). Research attention has been given to the development of typologies of uncertainty (see Kann & Weyant, 2000; Morgan et al., 2012; Morgan, 2003; Walker et al., 2003; Ragas et al., 2009); tools for selecting methods for uncertainty analysis (see van der Sluijs et al., 2003); and frameworks for assessment of uncertainties (see Janssen et al., 2005; Gabbert 2006). A variety of different types of

uncertainty have been defined and used in the literature (van der Sluijs et al., 2003; Heidmann & Milde 2013). However, there is no one particular definition or typology used for uncertainty practice as many fields of study have various definitions of uncertainty and context for study (van der Sluijs et al., 2003; Leung et al., 2015).

Walker et al. (2003) developed one typology (non-EA specific) to help decision-makers better understand and communicate about the types of uncertainty, and therefore, make better decisions to mitigate potential environmental effects. The authors' typology classifies uncertainty in three ways. First, the *location* of uncertainty (i.e., where uncertainties occur). Examples of location would be context, model uncertainty, inputs, parameter uncertainty, etc. (see also Harremoës, 2003). Next, the *level* of uncertainty (i.e., where the uncertainty reveals itself) along a spectrum from determinism, statistical uncertainty, scenario uncertainty, recognized ignorance, indeterminacy, to absolute ignorance (Harremoës, 2003). Lastly, the *nature* of uncertainty, for example, whether the uncertainty is due to the imperfection of our knowledge or the inherent variability of the natural world (Walker et al., 2003). Examples of the *nature* of uncertainty are divided into two categories: *variability uncertainty* due to inherent unpredictability, which is especially relevant in human and natural systems and concerning social, economic, and technological developments, and *epistemic uncertainty* due to the imperfection of our knowledge, which may be reduced by more research and empirical efforts (Walker et al., 2003).

Based on this typology, Walker et al. (2003) propose an 'uncertainty matrix' as an investigative means for classifying and reporting dimensions of uncertainty (Walker et al., 2003; see also van der Sluijs et al., 2003). The matrix can be used to improve communication among analysts, policy makers, and stakeholders (Walker et al., 2003; see also van der Sluijs et al., 2003). Adopting a common uncertainty typology in EA such as the Walker et al. typology might help to prevent miscommunication (Morgan et al., 2012), by encouraging uncertainty communication and disclosure. However, Morgan et al. (2012) suggest that distinct EA-specific approaches to classifying uncertainty are difficult to define due to the wide variation of professional backgrounds of practitioners and professional cultures that exist in EA.

Maier et al. (2003) discuss one type of uncertainty that has received limited attention in the literature, which is uncertainty related to human input. For example, the values and attitudes of the decision-makers or environmental managers as well as the social dynamics of the particular project

can significantly impact whether a problem is addressed, which can have major influence on the final outcome of the project approval process (Maier et al., 2003). Many EA processes have variations in values and judgments embedded within them, and it is important to reflect those variations in the final decision about project approval (Geneletti et al., 2003; Morgan, 2012), yet the treatment of the uncertainty of those judgments is usually disregarded by decision-makers (Reckhow, 1994; Geneletti et al., 2003).

Sigel et al. (2010) define two types of uncertainty: one being fact-related which exists when a person lacks knowledge regarding facts, and the other being norm-related uncertainty which is when a person lacks confidence about his/her knowledge regarding norms or values. Ronlyn Duncan (2013) proposes that fundamental assumptions should be negotiated with all stakeholders before applying them to a model, and that explicit statement of uncertainties helps keep models free from subjectivity. However, Wilkins (2003) argues that subjectivity is unavoidable in predictions due to politicized evaluations, narrow boundaries (i.e., time, interests, financial restrictions, or lack necessary expertise to address pertinent issues), data gaps and simplified assumptions. Wilkins (2003) also states that the people engaged in EA play a significant role in its results because a considerable number of decisions are subjective. Sheate and Partidário (2010) go deeper into the idea of using values, suggesting that decision-makers should remain open to stakeholder values. By doing so, proponents should be less able to influence and control environmental information and analysis, and be less able to ignore project uncertainties (Bidwell et al., 1987; Duncan, 2008; Duncan, 2013; Morgan et al., 2012; Wood, 2008).

## 2.5 THEORETICAL APPROACHES TO EXPLAINING UNCERTAINTY IN EA

### 2.5.1 *Prospect Theory*

Two prominent theories are used to help manage uncertainty and are applied in the EA context. The first, prospect theory, reveals that decisions that are more uncertain are more risky (Kahneman & Tversky, 1979). This theory suggests that “individuals assess the value of outcomes in relation to a reference point” (Paddock et al., 2015: 168). Prospect theory describes the way people choose between probabilistic options that involve some risk, where the probabilities of outcomes are known. Tversky & Kahneman (1992:297) describe this theory as “a model of

choice.” It describes choices with risky scenarios and a small number of outcomes (Kahneman & Tversky, 1979) - downplaying or exacerbating risk depending on the situation.

Prospect theory distinguishes two phases in the decision-making process: framing and valuation (Tversky & Kahneman, 1992). In the framing stage the decision-maker develops a representation of all the probable outcomes and possibilities that are relevant to the final outcome of the decision (Tversky & Kahneman 1992). In the valuation stage the decision-maker assesses the value of each prospect presented and then makes a choice (Tversky & Kahneman, 1992). Research has shown that theories regarding decision-making practices suggest that undesirable or negative outcomes exert greater influence on later judgments than do positive events (Kahneman & Tversky, 1979). This is important for decision-making processes and protocols like EA, as many decisions are based on values and previous experiences (Maier et al., 2003).

Prospect theory applied in EA practice stresses that uncertainties should be disclosed early in the EA process so that decision-makers can make informed decisions and avoid higher risks (Tversky & Kahneman, 1992). The theory is based on real-life choices and their complexities, rather than on situations where there are no other available decision options that will lead to a better outcome. This is a worthy theory to apply to EA due to the complex decision-making practices in EA (i.e., predictions about how the natural environment may react to certain changes and so on). As EA is a framework used to make informed decisions based on incomplete information or knowledge (Snell & Cowell, 2006) this theory can support decision-makers by offering a strategy whereby they can look closely at the probabilities and associated risks of their choices.

### *2.5.2 The Certainty Trough*

The other prominent uncertainty-related theory used in EA is ‘the certainty trough’ explained by Duncan (2013) in an EA context, but developed by MacKenzie (1999). Collins (1987: 692) reports “studies have shown that there is a relationship between the extent to which science is seen as a producer of certainty and the distance from the research front.” Building on this understanding, Duncan (2008) considers that one’s distance from where the knowledge about a particular project is generated affects one’s perception of related uncertainties. Knowledge ‘producers’, such as consultants, would perceive a lower level of uncertainty about the knowledge (since they are producing it), but those external to the knowledge production, such as the general

public or NGOs, perceive the highest level of uncertainty. In the middle of the trough are the knowledge ‘users’ who manage the knowledge (i.e., the proponents or regulators), and these stakeholders perceive, or “choose to perceive” the greatest level certainty (Leung et al., 2016: 97; see also Duncan, 2008). Duncan (2008) explains that the knowledge ‘producers’ like consultants are able to better understand and be aware of possible outcomes in their predictions where the knowledge ‘users’ like the proponents and the regulators have to depend on these producers to communicate any uncertainties to them.

A study completed by Leung et al. (2016) demonstrates no difference between producers (i.e., consultants) and users (i.e., proponents). However, their study does not differentiate among the many consultants in EA; there are numerous different types and levels of consultants in that process (Leung et al., 2016). Some consultants may have only been involved in a writing stage (i.e., using the knowledge for writing assessments and desktop studies) rather than producing knowledge. In the study completed by Leung et al. (2016), it is demonstrated that proponents believe that uncertainty is given due consideration during consultation process, whereas those whose interests are affected, such as environmental NGOs, do not believe uncertainty is being sufficiently addressed. This study demonstrates that consultants and proponents who can be both considered knowledge producers feel that uncertainty is sufficiently communicated (Leung et al., 2016).

As previously discussed, there are many stakeholders involved in EA practice from varying fields and backgrounds, and these stakeholders work together to develop a robust EIS (Duncan, 2013; Leung et al., 2016). Research has shown that proponents could alter their documents (reported information) to appear more politically palatable than they actually are, which limits the disclosure about uncertainty (Tennøy et al., 2006; Duncan, 2008). Consequently, and importantly for EA, the players considered to be knowledge producers (e.g. consultants or even proponents) have the power to withhold uncertainties. Knowledge producers fear that if the uncertainties are identified, those in opposition can use them to undermine claims supporting technological development, mitigation measures (Tennøy et al., 2006; Duncan, 2008).

### *2.5.3 Precautionary Principle*

Jalava et al. (2013: 280) define the precautionary principle as “environmental protection based on precaution, even where there is no clear evidence of harm or risk from an activity.” In other words, lack of evidence should not be used as a reason to skip steps that might help prevent environmental damage (Snell & Cowell, 2006). The ‘precautionary principle’ specifically deals with situations where uncertainty prevails: it has been introduced in EA as a means of dealing with uncertainty in decision-making and impact management (Harremoës, 2003; Jalava et al., 2013; Walker et al., 2003).

Gustavson (2003) explains that when used in environmental management, the precautionary principle stipulates the necessity of allowing for scientific uncertainty, especially where there is potential for serious or irreversible harm due to human actions. Researchers call for greater use of the ‘precautionary principle’ (Jalava et al., 2013; Lemons, 1996; Tennøy et al., 2006; Wood, 2008; Wynne, 1992). For example, Lemons (1996) suggests implementing legislative mandates that clearly adopt the ‘precautionary principle’ to deal with uncertainty. Harremoës (2003) advocates use of the precautionary principle as “environmental impacts are less than well known and that lack of knowledge ought to affect decision-making.” Jalava et al. (2013: 280) believe it is beneficial for decision-makers to adopt the precautionary principle as ‘a state of mind,’ helping the decision-makers to become more sensitive to uncertainties. The use of the precautionary principle in EA helps identify, reduce, and limit uncertainties and negative impacts associated with large-scale developments (Jalava et al., 2013). The nature of EA is based on making predictions. Therefore, uncertainty factors and risks deserve constant attention, and demand a precautionary approach (Jalava et al., 2013).

Similarly, Snell & Cowell (2006) suggest that the scoping stage of EA is a crucial stage when the precautionary principle should be used as scoping is used to help determine potentially significant impacts. However, the precautionary principle is not always an integrated concept (Snell & Cowell, 2006). This has been identified as a key issue, as EA is positioned and promoted as a tool used for mitigating or avoiding environmental damage based on sound information. In the scoping stage, a judgment call has to be made about which impacts are “likely to be significant,” in advance of more detailed information (Snell & Cowell, 2006: 306). Gustavson (2003) suggests that opening the scoping stage to a larger range of inputs by other organisations and the general

public can support the explanation and use of the precautionary principle. This may increase the legitimacy of the EA process, equalize concerns regarding developer bias (Snell & Cowell 2006), and possibly benefit uncertainty consideration and communication practices.

## 2.6 RESEARCH PROGRESS IN OIL SANDS MINING AND EA

Natural resource development has the potential to significantly impact the environment (Latifovic & Pouliot, 2014), societies (Dendena & Corsi, 2015), and can pose a substantial threat to Indigenous Peoples' subsistence practices (Kirsch, 2014). The goal of EA within natural resource development is to identify and assess potential impacts of a proposed project in order to improve its design toward reducing the effects on environment, and if necessary to develop mitigation measures (Latifovic & Pouliot, 2014). Along with significant environmental effects, persistent social issues have also accompanied oil sands development (i.e., infringements of treaty and Aboriginal (Mantyka-Pringle et al., 2015).<sup>2</sup> Due to the increased pace of mining developments there has been strong public debate about mining (including oil sands mining) and its sustainability (Mudd, 2010). The past decade in particular has seen an increasing discussion of the need to shift overall mining practices toward a more sustainable approach, with many companies now reporting annually on their sustainability performance (i.e. Global Reporting Initiative (GRI)) (Mudd, 2010; Norgate & Haque, 2010).

### 2.6.1 *A Brief History of Canadian Oil Sands Mining*

Canada's oil sands in northeastern Alberta contain some of the major known oil reserves in the world (Sherrington, 2005; Boutilier & Black, 2013). Most of the oil sands extraction in Canada has been focused on the Athabasca Oil Sands (AOS) deposit (Latifovic & Pouliot, 2014). In the past decade or so (2000-12), the AOS region has devoured investments exceeding C\$390 billion, making it a significant factor in the Canadian economy, encouraging continuous mining development (Latifovic & Pouliot 2014). Production from oil sands was expected to triple between

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<sup>2</sup> Aboriginal rights are collective rights of Aboriginal people for the continued use and occupation of certain geographical spaces. Although these rights may differ between Aboriginal and Aboriginal communities they usually include the right to the land including rights to resources and activities like hunting and fishing, as well as self-governance and practice of their own culture and customs (UBC, 2009).



2005 and 2015 to over three million barrels a day (Westman, 2013). In 2010, the ERCB estimated remaining volumes-in-place to be about 270 billion m<sup>3</sup> (Gosselin et al., 2010). The major oil sands area in Alberta (AOS) encompasses more than 80,000 km<sup>2</sup> and by 2008 mining had disturbed 530 km<sup>2</sup> of boreal landscape, with tailing ponds covering more than 130 km<sup>2</sup> (Kelly et al., 2010). During the last decade many EAs have been completed for many major oil sands mines in Canada (O'Faircheallaigh, 2010). An additional 1,350 km<sup>2</sup> of land are approved for oil sands mining development (Westman, 2013). There are two predominantly used methods of oil extraction: surface pit mines or *in-situ* mines (drilling, heating and pumping) (Sherrington, 2005; Westman, 2013). Both surface mining and in-situ methods in mining are energy intensive activities (Woynillowicz & Severson-Baker, 2009). With an in-situ (e.g., SAGD) project, the main extraction process used is Steam Assisted Gravity Drainage (SAGD) (Sherrington, 2005). This process pumps out bitumen to the surface via wells by injecting high-pressure steam.

Though there have been many technological successes in the past 20 years (i.e., the use of slurry hydro-transport pipelines for bitumen conditioning) (Gosselin et al., 2010), Canada's oil sands regions should still be considered an unconventional source of oil (Isaacs, 2005). It is important to reflect on the definitions of 'conventional' and 'unconventional' oil; though definitions are not consistent in literature, they essentially refer to the tools used to extract the oil and gas (Isaacs, 2005). For example "offshore oil was not considered conventional 40 years ago, and hi-tech development shifts using enhanced recovery techniques, including thermal production, have moved unconventional sources to the conventional category" (Isaacs, 2005: 1). Nevertheless, "oil sands production has become increasingly controversial because of several widely publicized environmental and health issues" (Gosselin et al., 2010:1). Ludwig (1993) suggests that scientists and industry representatives are too dependent on present and future technological advancement. The industry is seen by some as collaboratively and creatively trying to address problems, but others view both industry and government as inflexible and closed to the conversations concerning the pace and scale of development (Boutilier & Black, 2013). Currently, there are approximately at least 7 operating oil sands surface mines and 31 in-situ facilities, 2 oil surface sands and 19 in-situ facilities sites which have been approved, and 3 more oil sands mines and 23 in-situ facilities which have been proposed in the area (Alberta Environment, 2016).

The recent changes in Canadian EA legislation (CEAA 2012) are significant in Alberta in

particular. Many changes affect the regulatory bodies in place to manage EA in the province; the new Alberta Energy Regulator (AER) has taken over the former responsibilities of the Energy Resources Conservation Board (ERCB), Alberta Environment and Sustainable Resource Development (AESRD), and the Environmental Appeals Board (EAB) (Bowness & Hudson, 2014). The recent changes in EA legislation aggressively limits public participation in Alberta, which is unfortunate as bitumen is a public resource and so the fate of such a resource should rest within the public's hands (Bowness & Hudson, 2014).

#### *2.6.2 Uncertainty with Large-Scale Oil Sands Developments*

Concerns are often raised about the uncertainty of the potential long-term impacts of such large-scale oil sands developments, which has triggered some rigorous programs and research for the AOS region (Latifovic & Pouliot, 2014). The scale, intensity, and likelihood of mining expansions in the AOS make the region unique for scientific study, particularly with regard to setting environmental standards, environmental monitoring, and mitigation measures (Latifovic & Pouliot, 2014). The priority of environmental research during overall responsible natural resource development is to improve our understanding of the long-term consequences that industrial activities may have on the natural systems (Latifovic & Pouliot, 2014), which can help with future uncertainties.

Gosselin et al. (2010) make reference to the most common, and arguably the most problematic uncertainties in the oil sands industry: uncertainty in climate change models; uncertainty in the quality of reporting and results of green house gas emission studies (see also Woynillowicz & Severson-Baker, 2009); uncertainty in the predictions of impacts to ground and surface water (i.e., ground water system parameters cannot be adequately quantified); uncertainty in the development and operation of end pit lakes; uncertainty in the assessment of water quality of downstream environments (see also Kelly et al., 2010); uncertainty in reconstruction/reclamation of ecosystems like wetlands (i.e., differences in predicted outcomes versus actual outcomes due to natural complexities such as weather changes); uncertainty with reclamation of any closing mine site; and uncertainty with assessments of cumulative effects (see also Woynillowicz & Severson-Baker, 2009).

Research in the AOS region has mostly been quantitative: for example, research on water

treatment technologies (see MacKinnon & Boerger, 1986; Allen, 2008; Quinlan & Tam, 2015); naphthenic acids (see Herman et al., 1994 ; Holowenko et al., 2002; Rogers et al., 2002; Headley & McMartin, 2004; Clemente & Fedorak, 2005; Grewer et al., 2010; El-Din et al., 2011); trace metals (see Kelly et al. 2010); peaking analysis (see Greene et al., 2006); processing (see Sanford, 1983; Barrow et al., 2010); modeling (see Butler, 1985; Hovadik & Larue, 2007); ecotoxicology (see; Colavecchia et al., 2004; Nero et al., 2006; van den Heuvel et al., 1999); emissions (see Charpentier et al., 2009); groundwater (see Fried, et al., 1979; Abdul et al., 1990); vegetation (see Latifovic & Pouliot, 2014); and so on. Qualitative research has mostly focused on Aboriginal involvement in EA processes, and public participation more generally (see O’Faircheallaigh, 2006; Westman, 2013; Westman, 2013).

Many approvals for oil sands developments condition that monitoring programs must be developed and implemented as part of impact assessment follow-up (Gosselin et al., 2010). It has been noted by many authors that ongoing monitoring is crucial for responsible resource development as it is used to determine baseline conditions and to identify unforeseen effects (see Latifovic & Pouliot, 2014). One example of a monitoring program implemented in the AOS region is the Regional Aquatics Monitoring program (RAMP). The Regional Aquatic Monitoring Program is a multi-stakeholder environmental monitoring program that assesses the health of watercourses and water bodies (Gosselin et al., 2010). Moreover, in response to increased criticisms of mining activity destruction to wildlife and ecosystems, the Alberta government implemented its Lower Athabasca Regional Plan (LARP), which in theory was “supposed to balance economic activity with social and environmental needs.” (Mantyka-Pringle et al., 2015: 799) Still, when LARP was implemented many of the recommendations by Aboriginals people were largely disregarded (Mantyka-Pringle et al., 2015).

Due to the rapid pace of development in the AOS region many of the various stakeholders have become concerned with uncertainties related to cumulative environmental effects assessment (see Sherrington, 2005; Boutilier & Black, 2013). In fact, there is a historical lack of cumulative effects assessment in the oil sands, which has become a great concern for many (Gosselin et al., 2010). The cumulative effects of natural resource extraction processes and projects can have negative impacts on more than just one region: also on surrounding natural, social and economic environments (Boutilier & Black, 2013). These impacts can involve multiple regulatory bodies,

which can make governance of such effects very complex (Boutilier & Black, 2013). In other words, as oil sands development keeps expanding, the developments are causing negative cumulative impacts that are potentially beyond the scope of the existing regulatory regime (Boutilier & Black, 2013).

Concerns with development expansion have led to the formation of the Cumulative Environmental Management Association (CEMA), a multi-stakeholder organization consisting of Aboriginals, industry representatives, and the scientific community. CEMA was put into place to manage the cumulative effects of industrial development in northeastern Alberta, and identifies general areas of concern and information gaps in environmental protection in the AOS region (Sherrington 2005). There have been many frustrations and criticisms associated with CEMA, such as a concern with the lack of progress on water issues (Gosselin et al., 2010). In 2008, a number of Aboriginals and NGOs withdrew from CEMA due to a lack of confidence in the program and were frustrated with its management and structure (Gosselin et al., 2010). In 2011, CEMA reorganized its system in response to the feedback from the participants and stakeholders.

Mantyka-Pringle et al. (2015) suggest that a pause is essential on all new major projects, allowing for monitoring and assessment to catch up with existing cumulative impacts. In this way, stakeholders can develop a better strategic plan to respond to future social and ecological impacts (Mantyka-Pringle et al., 2015).

### *2.6.3 Aboriginals and Indigenous Involvement in Oil Sands Developments*

The rights of Aboriginals and Indigenous people to be involved in the environmental management of projects have won increasing amounts of attention within governments and policies (O'Faircheallaigh, 2006). Recognition of public, and Aboriginal input is important, but it is often not put into practice. Justus and Simonetta (1982) revealed that many mega projects seriously disrupt the social fabric of Aboriginal communities in the AOS region, and concluded that Aboriginal Peoples and communities must have control over their lives, lands and resources, and social services and infrastructure must be in place prior to development. Yet still, initial failure to involve Aboriginal and Indigenous communities can result in conflict and cause the process to be more adversarial (O'Faircheallaigh, 2010)

Often much of Aboriginal and Indigenous input does not get implemented into the

operational stages of the projects (O’Faircheallaigh, 2006). Mantyka-Pringle et al. found that “consultation as currently practiced is largely one-sided, with many communities feeling powerless, often pragmatically accepting new developments, hoping the financial benefits will outweigh the social and/or environmental consequences” (2015: 798). For example, Westman (2013) concluded that impact assessments done on the oil sands region are not being completed in a manner consistent with sound anthropological practices, with federal legislation, or with the constitutionally protected rights to a subsistence livelihood outlined in Treaty 8 and within the *Constitution Act, 1982* Section 35, recognizing and affirming Aboriginal Rights (Constitution Act, 1982). Moreover, governments must consult Aboriginal communities when developments are proposed on lands in which the community has an interest (Mantyka-Pringle et al. 2015; Newman, 2009). Moreover, many SEAs completed use computer modeling to describe impacts on complex, social ecological terrain, which is not always validated or correct (Westman, 2013). Howitt (1995) has reported that it is unlikely that EA will become a major tool of empowerment for the public and Aboriginals in Australia, but the rich literature and continuous work on the subject can increase communication and social change.

## 2.7 LITERATURE GAP

Over the years, EA has undergone many changes including new integrated approaches and new modes of environmental governance (Cashmore et al., 2009), but many decisions are made without giving uncertainty enough consideration (Harremoës, 2003). In most cases uncertainty is inadequately accommodated in current EA processes (Bond et al., 2014). Much of the research in EA is based on the assumption that the provision of scientific knowledge and the recognition of uncertainties will aid in the decision-making process (Bond & Pope, 2012; Kornov & Thissen, 2000; Pielke, 2007; Sheate & Partidário, 2010).

Still, recognition of uncertainty may not necessarily make decision-making more effective. If EA is to function as a sound decision-making tool, decision-makers must actually consider uncertainty when making decisions (Reckhow, 1994). This means proponents must readily acknowledge it and communicate it, despite it not being eagerly communicated, nor keenly received in communications between practitioners and stakeholders (Rabinovich & Morton, 2012). A. Tennøy et al. (2006) confirm that uncertainty is not even mentioned in 59% of the EISs and

58% of the decision documents. As decision-support tools or models increase in complexity, “the need to consider uncertainty at all stages of the decision-making process becomes more important so that decisions can be made with confidence or known certainty” (Maier et al., 2008: 81-82). The omission or underestimation of uncertainties may result in bias during the decision-making process towards project approval.

There is poor understanding of how decision-making actually works (Bond & Pope, 2012) and limited work has been done on how uncertainty, when acknowledged, is communicated and understood by decision-makers and the public. The work that has been done is mostly in European and Scandinavian contexts (Dipper et al., 1998; Geneletti et al., 2003; Söderman, 2005; Tennøy et al., 2006; Wardekker et al., 2008; Wood, 2008), with some work done on computer-based predictive models (Duncan, 2008; Harremoës, 2003), and post-auditing models (Dipper et al., 1998; Wood et al., 2000). Though reducing uncertainty in predictive models is important, EA predictions cannot always rely on models because they simply cannot reproduce reality: the environment is too dynamic and without uncertainty consideration, modeling approaches to prediction will lose reliability (Geneletti et al., 2003; Harremoës, 2003). As previously stated, uncertainty is classified in many different ways in the literature, but the vast majority of studies that have been completed focus on quantifying uncertainty, and ignore its qualitative aspects (Maxim & van der Sluijs, 2011).

Issues related to uncertainty in EA processes have received increased attention since the mid-1980s (Lemons, 1996), but there has been no research on the contextual dynamics of uncertainty consideration and acknowledgement among practitioners and decisions-makers, or the extent to which assumptions and data limitations are communicated by the project proponent’s EIS (Beattie, 1995; Tennøy et al., 2006). Boutilier & Black (2013) provide an overview of both the Alberta oil sands industry and the New South Wales coal industry. They describe stakeholder dynamics at different levels of industrial development planning, but there is still a pressing need in these industries for research on stakeholder relations that take into account the matter of shared futures (Boutilier & Black, 2013). Westman (2013) does discuss this idea of shared futures, and concludes that there is a “deep gap between cultural assumptions of consultants and Indigenous people about the futures being projected” (Westman 2013:117). Uncertainty results then when narrowly constructed cultural views conceived by consultants, bureaucrats, and government officials (who

find it difficult and time consuming to discuss Indigenous cultural traditions: traditions that are more spiritual than technical in nature) do not appropriately write the futures of Indigenous Peoples in the tar sands region (Westman, 2013).

Once the major players involved in EA free themselves from the illusion that the sciences of technology development are the solution to resource or conservation problems and focus on the current issues of uncertainty, effective policies can be made (Ludwig et al., 1993). These policies must take uncertainty into account now and not depend on future scientific and technological developments (Ludwig et al., 1993). Research on the contextual dynamics of uncertainty consideration and disclosure is especially important at this time. There are many major energy projects looming in Canada and uncertainties should be clearly stated upfront and understood by affected interests and all other stakeholders so that decisions are made with a high degree of confidence and prescriptive measures to prevent environmental degradation can be applied.

## **Chapter Three**

### **Methodology**

#### **3.1 METHODS**

This study adopts standard methods of qualitative inquiry in collecting and analyzing data in the social sciences and environmental assessment. The appropriateness of qualitative research for this study is due to its potential to illuminate human environments and dynamics, individual experiences, and social processes (Hay, 2000). The data come primarily from semi-structured interviews, supplemented by a general review of case-related documents.

##### *3.1.1 Document Review*

Prior to field data collection, and ongoing throughout the study, a general review of documents related to the Joslyn North Mine environmental impact assessment (EA) process was undertaken. Document review is a widely utilized method in qualitative research, as it provides a basis to understand the current status of the topic of research (Bryman, 2015; Bailey, 2007). Importantly, documents provide a good measure of the validity of primary data given they are non-reactive (Bryman, 2015). Not only can document review be used to corroborate, refute, or further illustrate interview data, but it can also provide an additional, independent source of data to address research questions, and in this case, help describe the context surrounding the Joslyn North Mine case.

Documents reviewed in-depth for the purposes of this research include government documents, industry (proponent) documents, and other ‘grey’ literature, namely the environmental impact statement (EIS), the review panel’s decision document with recommendations, panel review transcripts, and supplemental information requests related to the



hearings. Table 3.1, provides a full list of case documents reviewed to supplement the semi-structured interviews.

**Table 3.1:** List of documents reviewed to supplement the interview data

<b>Assessment Documents</b>	<ul style="list-style-type: none"> <li>• Environmental Assessment documents</li> <li>• Supplemental information requests</li> <li>• Application for project</li> <li>• Statements of concern (Aboriginals, Parks Canada etc.)</li> <li>• Decision documents</li> <li>• Information on follow-up program</li> </ul>	<ul style="list-style-type: none"> <li>• Deer Creek Energy Limited. (2006). The Joslyn North Mine Project: Project Description (Section B). <a href="https://external.sp.environment.gov.ab.ca/DocArc/EIA/Pages/default.aspx">https://external.sp.environment.gov.ab.ca/DocArc/EIA/Pages/default.aspx</a></li> <li>• Deer Creek Energy Limited. (2005). Wildlife Assessment For the Deer Creek Energy Limited Joslyn North Mine Project (C59900000). <a href="https://external.sp.environment.gov.ab.ca/DocArc/EIA/Pages/default.aspx">https://external.sp.environment.gov.ab.ca/DocArc/EIA/Pages/default.aspx</a></li> <li>• Deer Creek Energy Limited. (2006). Socio-Economic Assessment Joslyn North Mine Project – Phase 1 &amp; 11 (IPS Consulting Inc.). <a href="https://external.sp.environment.gov.ab.ca/DocArc/EIA/Pages/default.aspx">https://external.sp.environment.gov.ab.ca/DocArc/EIA/Pages/default.aspx</a></li> <li>• Deer Creek Energy Limited. (2004). Proposed Terms of Reference: Environmental Impact Assessment Report For Joslyn North Project. <a href="http://www.ceaa.gc.ca/050/documents_staticpost/cearref_37519/142/Section_D_Environmental_Assessment.pdf">http://www.ceaa.gc.ca/050/documents_staticpost/cearref_37519/142/Section_D_Environmental_Assessment.pdf</a></li> <li>• Energy Resources Conservation Board (2011). Report of the Joint Review Panel: Joslyn North Mine Project Total E&amp;P Joslyn Ltd. Alberta. Retrieved from: <a href="https://www.aer.ca/documents/decisions/2011/2011-ABERCB-005.pdf">https://www.aer.ca/documents/decisions/2011/2011-ABERCB-005.pdf</a></li> <li>• Energy Resources Conservation Board (2012). Total E&amp;P Joslyn Ltd: Application for an Oil Sands Mine and Bitumen Processing Facility – Joslyn North Mine Project Fort McMurray Area. Retrieved from: <a href="https://www.aer.ca/documents/orders/cost-orders/ECO2012-002.pdf">https://www.aer.ca/documents/orders/cost-orders/ECO2012-002.pdf</a></li> <li>• Alberta Energy Regulator (2013). Amendment Application: Joslyn North Mine Project Modifications (Sections 1, 4, 11 and 13). Retrieved from: <a href="http://www.total-ep-canada.com/upstream/documents/2013_amendment/Working%20PDF/Application_and_Appendices_Nov_2013/AER_AmendApp_Section_1.pdf">http://www.total-ep-canada.com/upstream/documents/2013_amendment/Working%20PDF/Application_and_Appendices_Nov_2013/AER_AmendApp_Section_1.pdf</a></li> </ul>
<b>Agreements and Correspondence</b>	<ul style="list-style-type: none"> <li>• Email correspondence between stakeholders</li> <li>• Conservation agreement between TEPCA and Environment Canada</li> </ul>	<ul style="list-style-type: none"> <li>• Environment Canada. (2011). <i>Conservation Agreement</i>. Retrieved from: study participant.</li> <li>• Environment Canada: Protection operations Directorate (Personal Correspondence, May 17, 2010)</li> <li>• Department of Justice Canada, K. Lambrecht (Personal Correspondence, September 7, 2010)</li> </ul>
<b>Grey Literature</b>	<ul style="list-style-type: none"> <li>• Public announcements – Notice of application</li> <li>• News articles</li> </ul>	<ul style="list-style-type: none"> <li>• Healing, D. (2015, March 9) Total SA Pulls Joslyn North Oilsands Mine Amendment Application. <i>Financial Post</i>, online. Retrieved from: <a href="http://business.financialpost.com/news/energy/total-sa-pulls-joslyn-north-oilsands-mind-amendment-application">http://business.financialpost.com/news/energy/total-sa-pulls-joslyn-north-oilsands-mind-amendment-application</a></li> <li>• Tait, C. (2014, May 30). Total Shelves \$11-billion Alberta Oil Sands Mine. <i>The Globe and Mail</i>, online. Retrieved from: <a href="http://www.theglobeandmail.com/report-o-business/joslyn/article18914681">http://www.theglobeandmail.com/report-o-business/joslyn/article18914681</a></li> <li>• H. Campbell (Personal Communication, February 25, 2015).</li> </ul>

Although the document review was not a structured content analysis, to expedite the review process as some of them are hundreds of pages long, particular phrases (keywords) such as wildlife, species at risk, communication, uncertainty (and its synonyms) were used to locate relevant information within the document. These phrases were reflective of the research purpose and objectives described earlier in Chapter One. The document review proved fruitful as a means to supplement primary data collected via the interviews.

### *3.1.2 Semi-Structured Interviews*

It was assumed that particular dynamics and contextual factors (i.e., experiences and views) associated with uncertainty and the Joslyn North Mine case were not captured within the written record, thus necessitating interviews with key case informants. Semi-structured interviews are casual, flexible bi-lateral exchanges between the interviewer and the interviewee (Hay, 2000). This method was employed to better understand communication that took place among the proponent, government representatives, consultants and stakeholders about uncertainties in project-specifications, and uncertainties regarding species at risk and other wildlife specifically. The semi-structured nature of the interview questions allowed participants to more freely speak (more than if a structured interview process was employed) about their experiences and views, while still allowing the researcher to maintain consistent lines of questioning.

Potential participants for the interviews were first identified based on personal contacts and on project documentation. These people were asked to identify other potential participants. This method is known as snowball sampling (Hay, 2000; McIntyre, 2005). More than half of the interviewees were identified using a snowball sampling method. Participants were not necessarily those with wildlife experience or experience with uncertainty, but those who possess sufficient knowledge in the EA process and were intimately involved in the Joslyn North Mine hearing and regulatory process. In total, 19 interviews with stakeholders, practitioners, Aboriginal industry relations representatives, regulators, decision-makers, interveners, and a member of the review panel, all of whom were directly involved with the Joslyn North Mine project, were completed. Each interview was approximately 30 to 90 minutes in length with the average interview lasting 45-50 minutes. Specific topics of discussion in the interviews included the perceived benefits and

risks of uncertainly disclosure; communication of uncertainty; uncertainty in the assessment; gauging uncertainty; influence of context on uncertainty communication and disclosure; and suggestions for improved practice. All interviews were digitally recorded, and transcribed with permission.

Table 3.2 demonstrates the distribution of interview participants by role: the majority of participants (8) are/were consultants and practitioners for the Joslyn North Mine case. It was relatively straightforward to classify each participant with respect to their role, as their professional titles were often stated in the EIS, in project-related correspondence, or in correspondence with the researcher. To ensure that the interview schedule was effective and clear, pilot testing was completed with three volunteer graduate students at the University of Saskatchewan (Kitchin & Tate, 2000) familiar with EA. Pilot interviews were performed with graduate students and not actual study participants because of the small pool of potential interviewees.

**Table 3.2:** Distribution of interviewees by role; this table does not include the limitations of participants who would declined offers to participate discussed in Section 3.4 (e.g., the project proponent, Aboriginal Peoples) or those who dropped out of the study (member of CEAA).

<b>Role</b>	<b>Description</b>	<b>Number of Participants (19)</b>
<b>Consultants/Practitioners</b>	Individuals under a corporate entity or provincial body who have the capacity to analyze and advise the proponent at different stages of the EA process; they are often responsible for the preparation of the EIS, technical reviews and analysis of the environmental effects.	Eight consultants/ practitioners who have a vast understanding of the Joslyn North Mine. Their experiences range in different areas including air emissions, wildlife, species at risk and reclamation.
<b>Panel Member</b>	An individual appointed by the Minister of the Environment who assesses whether the EIS prepared by the proponent is sufficient to proceed to public hearings. Following the hearing, he/she prepares a report including decisions, conclusions, and recommendations.	One panel member from the Federal Joint Review Panel for the Joslyn North Mine Project.
<b>Regulators/ Decision-makers</b>	Representatives from the Alberta Energy Regulator and members of the federal regulatory body who are responsible for coordinating EAs and are managers of environmental assessment for the federal government.	Five representatives from the Alberta Energy Regulator and federal governing bodies who were intimately involved in the Joslyn North Mine Project.
<b>Interveners</b>	Individuals and organizations funded in order to increase and ensure public participation. The participation of NGOs ensures affected interests' concerns are addressed.	Two representatives from two different organizations (e.g., Pembina Institute, Nature Canada) who were involved in the Joslyn North Mine Project.
<b>Aboriginals Representatives</b>	Officials who represent Aboriginals' interests. All are involved with industry relations and speak on behalf of the communities and Aboriginal organizations.	Three officials who represent two different Aboriginal organizations: Fort McKay Aboriginals and Fort McMurray Métis 1935.

Most interviews were conducted in person in Calgary, Edmonton, and Fort McMurray with the exception of a few due to scheduling conflicts or geographic inaccessibility: these few were conducted by telephone. A standard interview schedule was used (Kitchin & Tate, 2000), although one version of it was worded specifically for proponents and another version of it was worded for stakeholders and Aboriginals and Métis people, (Appendices D) this was done in order to gain an

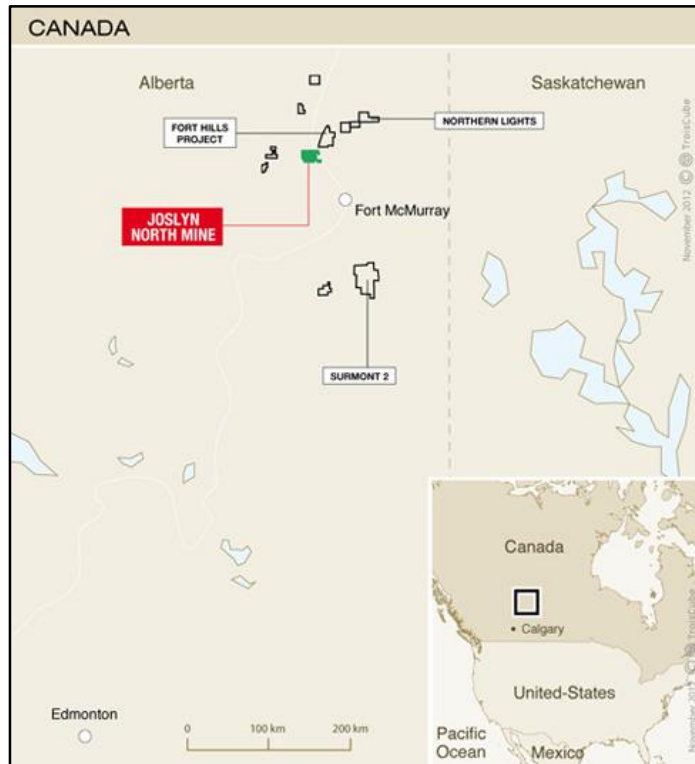
appropriate perspective of all stakeholders and affected interests involved in the Joslyn Case. The development of two separate stakeholder interview schedules ensured that the questions were suitable based on participant level and nature of involvement in the case. Proponents and their consultants, are often in a position to supply other stakeholders with information or knowledge on the case, whereas NGOs, Aboriginals and Government officials are often in a position to receive information, necessitating the separation of schedules.

Inductive coding was used to analyze interview data. First, MP3 digital audio files were transcribed. Each transcript was carefully proofread to ensure they were as close as possible to the recorded words of the interviewees, as well as to gain familiarity with the data before analysis was carried out (Cloke et al., 2004). Next, interview data were coded and qualitatively analyzed using NVivo® 10 software, with a particular focus on identifying areas of uncertainty acknowledgment, consideration, or discourse amongst participants. NVivo software enables data storage, coding, categorizing, retrieval, comparing, and linking. An open coding technique was employed. Corbin and Strauss (1990) define open coding as “analytic process through which concepts are identified and their properties and dimensions are discovered in the data.” Approximately four passes at coding were taken, to ensure satisfactory categorization of all interview data with respect to the research questions.

### 3.2 STUDY AREA

Total E&P Canada’s Joslyn North Mine project (Figure 3.1) provides the physical context for this research. The Joslyn North Mine is located in the regional municipality of Wood Buffalo, approximately 70 km northeast of Fort McMurray, Alberta (Total E&P, 2011). The proposed mine covers an area of just over 221 square km in Townships 94, 95, and 96, Ranges 11, 12, and 13, immediately Northwest of the community of Fort McKay, Alberta (Deer Creek Energy Limited, 2006). Overall, the Joslyn North Mine is expected to yield over 874 million barrels of bitumen over its 27-year lifespan, at the production rate of 100,000 barrels per calendar day (bbl/cd) (Deer Creek Energy Limited, 2006; Total E&P, 2011). Fort McKay is located approximately 29 km from the Joslyn North Mine development (Deer Creek Energy Limited, 2006) and is the community most directly affected by the project because of its close proximity. Fort McKay is home to Cree, Chipewyan, and Métis people; as of 2006 the estimated population is approximately 521 (Deer

Creek Energy Limited, 2006).



**Figure 3.1:** Joslyn North Mine in relation to other major energy projects in Alberta (Source: Adapted from 2b1st Consulting 2013).

The oil/tar sands region in northeastern Alberta, covered by mixed wood boreal forest and peatlands, contains the world's largest reserves of oil in the form of tar sand or bitumen (Sherrington, 2005). An extensive EIS was completed by Deer Creek Energy Limited (DCEL) in 2006 to provide information on current baseline conditions, potential cumulative effects of the development, reclamation plans, scope of the project, and monitoring before, during, and after development. Shortly after the completion of DCEL's EIS, an alternate company, Total E&P Canada (TEPCA) adopted the project.

In February 2006, TEPCA applied to the then governing body the Energy Resources Conservation Board (ERCB) (now the Alberta Energy Regulator), in accordance with to Sections 10 and 11 of the Oil Sands Conservation Act and Sections 3, 24, and 26 of the Oil Sands Conservation Regulation, and to AENV (Alberta Environment), in accordance with the *Environmental Protection and Enhancement Act 2000*, and the *Water Act 2000*, for the construction, operation, and reclamation of an oil sands surface mine and bitumen extraction

facility. The ERCB deemed the application technically complete in January 2008 and AENV determined that the environmental assessment report was complete in February 2008 (ERCB Decision Documents, 2011). The Joslyn North Mine project was assessed by a joint review panel under the *Canadian Environmental Assessment Act 1995*, which requires an approval decision from both federal and provincial governing bodies (different from current legislation).

Consistent with the Canada-Alberta Agreement for Environmental Assessment Cooperation (2005), the Canadian Environmental Assessment Agency and the ERCB agreed to establish a joint review panel agreement (ERCB Decision Documents, 2011). The Joslyn North Mine triggered a federal panel review because (i) DCEL's plan to reconstruct a waterway (Joslyn Creek) involved the Department of Fisheries and Oceans Canada (Section 35(2) of the *Fisheries Act*) and (2) it was in the public's best interest to employ a federal review panel due to the possibility of significant adverse environmental effects. The associated hearing process allows all interested parties to present evidence, concerns, and comments regarding the potential environmental impacts of the project. Subsequently, the panel prepares a report that includes their rationale, conclusions, and recommendations, and submits this report to the federal Minister of the Environment for his or her approval.

Some of the most predominant issues in the Joslyn North Mine EIS are impacts to habitat availability resulting in habitat alteration and loss, and reduced habitat effectiveness; impacts to habitat connectivity caused by barriers to wildlife movements; and direct and indirect mortality risks (Deer Creek Energy Limited, 2006). These concerns are similar to concerns raised in many other energy developments in Canada. Understanding how uncertainty is perceived and communicated through a mega-project like the Joslyn North this is relevant not only on a regional and provincial level, but on a national level as any negative effects do not have physical or social borders. Although these projects are often economically palatable and receive approval, whether and how project uncertainties are communicated and addressed is not well understood.

Participant funding was awarded during this project to six Aboriginal Organizations in the surrounding area who planned to consult with the federal government and participate in the public hearing: Athabasca Chipewyan Aboriginal, Meadow Lake Tribal Council, Mikisew Cree Aboriginal, Prince Albert Grand Council, Fort McMurray Aboriginal Industrial Relations Corporation and Chipewyan Prairie Dene Aboriginal (ERCB Decision Documents, 2011). Other



applicants that received funding to assist in the review of the assessment include, Sierra Club, the Pembina Institute, the Clearwater River Paul Cree Band, the Non-Status Fort McMurray Band Descendants and the Off-Reserve Fort McMurray Band (ERCB Decision Documents, 2011). There are other groups in the area that did not receive federal participant funding but who were still interested and had a stake in the Joslyn Mine development (i.e., Fort McKay Aboriginal and Métis Nation Local #63 and McMurray Métis Local 1935) (ERCB Decision Documents, 2011).

Cumulative effects were a major concern of the Joslyn North project as it is surrounded on three sides by other developments. Canadian Natural Resources Limited (CNRL) Horizon to the north, Suncor Fort Hills in the northeast, Syncrude Aurora to the north, Shell Muskeg River directly east, and Syncrude Mildred lake to the south (ERCB Decision Documents, 2011). Shell Jackpine, Syncrude Aurora South and Imperial Kearn Lake are also east of the proposed mine (ERCB Decision Documents, 2011). Almost all concerned parties brought up concerns regarding cumulative effects on wildlife, wildlife habitat, wildlife movement, water quality and quantity. Some other concerns were those factors such as water, overall development of the Athabasca River delta, Aboriginal/treaty rights and socioeconomic effects (ERCB Decision Documents, 2011).

It is important to briefly touch upon the current status of the project. In spring of 2014, TEPCA announced that the Joslyn oil sands mine would be shelved indefinitely. This halt was declared to be result of rising industry costs that made the \$11-billion project financially unsustainable (Tait, 2014). Total E&P Canada maintained that even though there was a halt they would continue its regulatory process while trying to figure out how to cut costs (Healing, 2015). In 2015, Total E&P became the latest foreign oil sands developer to withdraw a multibillion-dollar project from Alberta regulatory consideration, asking to cease their amendment application that was submitted in 2011 subsequent their project approval. (Healing, 2015).

### 3.3 RESEARCH ETHICS AND RESEARCHER'S BIAS

The emphasis when using qualitative methodologies is to understand lived experiences, and to interpret and reflect on the understandings of shared meanings and people's everyday social worlds and realities (Limb & Dwyer, 2001). As such, qualitative research has been described as research that views the world through a wide lens (Marshall & Rossman, 2014) while quantitative research provides a look through a narrower lens. Although quantitative methods are often regarded

as value-free and objective, this is untrue: no matter what we choose to study our values and beliefs influence the endeavour (Hay, 2000). Although it can be difficult to control research bias in qualitative research (Hay, 2000), due diligence has been employed to reduce bias as much as possible.

Interview themes in the semi-structured interviews were those used by other researchers investigating similar cases as part of a cross-Canada study and approved by all three lead investigators. The codes and themes created by the interview data were retrieved qualitatively based on the data characteristics. Use of varied sources also reduced the bias that can exist in a single method study (Bowen, 2009). All together the integration and convergence of data gathered from multiple sources of information and the described research methods helped limit bias by offering a solid understanding and applicability of the data (Bowen, 2009).

Semi-structured interviews raise two common ethical questions – confidentiality and consent (Hay, 2000; Cloke et al., 2004; Limb & Dwyer, 2001). The researcher strictly adhered to the ethical guidelines set out by the University of Saskatchewan's Behavioural Research and Ethics Board. All participants were informed about how the data were to be used, and were given the opportunity to consent to (or withhold) their participation in the study (Limb & Dwyer, 2001). Anonymity of the respondents was also ensured as data were reported in an aggregated form, making it possible to keep the identities of interviewees confidential (Eve, 2009).

### 3.4 STUDY LIMITATIONS

As with most research, there are a few limitations associated with the study design and data collection. First, because the study is partly retrospective (the Joslyn North Mine environmental impact assessment regulatory review process was completed prior to 2010), most participants originally targeted for the study were unreachable (retired, had moved to different provinces, switched jobs, etc.) due to lack of contact information.

Second, a major limitation of the research was a lack of participation on the part of the project proponent (TEPCA). Unfortunately, the Aboriginal Organization in Fort McKay was unreachable after many attempts to invite their participation. To compensate, interviews with officials who represent Aboriginal organizations who specifically deal industry relations for the targeted organizations were sought and obtained instead. Lastly, a representative of the Canadian

Environment Assessment Agency requested that their interview transcript be withdrawn from the study, meaning that there was no Agency representation in the study either. Regardless of these noted limitations, fulsome viewpoints of the participants on issues central to the study were elicited using the multiple sources of data (Tellis, 1997) described above.

## Chapter Four

### Results

Chapter Four begins by describing uncertainties identified in the EA process as discussed by interviewees. It then presents results related to uncertainty disclosure, consideration, and avoidance behaviour practices in the Joslyn North case and generally within EA. Thereafter, contextual factors within the Joslyn North case are reported. Lastly, interviewees' suggestions for improved practice of uncertainty disclosure, consideration and avoidance are described.

#### 4.1 EA PROCESS RELATED UNCERTAINTIES

The majority of interview participants<sup>3</sup> were intimately involved in the case, but some were not familiar with it or could not recall exact details of the case, and instead discussed uncertainties about EA processes in general. Thus, EA process uncertainties became a prevalent theme that emerged from the interview data. This section reports on three kinds of process related uncertainties: those related to the stages of project-based EIA itself; those related to the lack of integration of Aboriginals in EA; and those related to the regulatory process.

##### *4.1.1 Uncertainties in the Stages of Project-Based EIA*

Uncertainties in the *screening stage* emerge mostly from confusion with the Terms of Reference (TOR) used to set the stage an EA. The TOR are written guidelines developed by the proponent which describe the purpose and structure of a project, specify issues that need to be addressed an EA, and often define the scope or limitations of a project. The practitioners, regulators,

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<sup>3</sup> Each participant will be referenced anonymously throughout this chapter (i.e., Regulator (1), (2) and (3); Aboriginal Representative (1), (2), and (3); Panel Member (1); Practitioner (1) through (5); Consultant (1) through (5); and Intervener (1) and (2).

and consultants interviewed have identified project TOR as a key source of uncertainty for a few reasons.

First, uncertainties in an oil sands' project TOR tend to relate to items such as tailings treatment technology, and ground water and water management. Differences in treatment can have significant impacts on project design and required mitigation. Multiple practitioners raised the example of the uncertain effects of pollutants such as Naphthenic Acids. The panel member, and the majority of practitioners (four of five) and regulators (three of five) alleged that wet tailings, even those capped with fresh water will continue to be a toxic legacy of oil sands. In the Joslyn case, "DFO noted that there was uncertainty about how regional [development] impacts would affect the productivity of the lower Athabasca River watershed" (Report of Joint Panel, 2011: 97). Similarly, Regulator (1) comment that "reviewers were reasonably sure that there are effects to ground water and surface water because of tailings and the tailings by-products such as naphthenic acids." Regulator (2) suggested that it might be better to adopt a standard approach for developing the TOR for *all* oil sands projects, saying that, "If there were a more complete set of terms of reference then the right people would be involved with uncertainty communication. This way all party reviews in the project-based EIA could ask the questions they want to." This interviewee contemplated that if proponents and consultants are not guided by TOR requirements, the proponent might not perform as expected by some participants.

On the other hand, one practitioner noted that having standardized guidelines is a generic approach and might stifle innovation in the development of new and potentially better methods for TOR development: every project is different and therefore usually requires different data collection protocols. For example, Regulator (1) commented on the writing of a standardized TOR:

With uncertainty regarding impacts to the environment, there seems to be the same standard regardless of the size of the project. The uncertainty [discussed] is not on a project basis, which can be a problem because they (the projects) are all somewhat different. Because of the Terms of Reference any of the standards that do exist are the same. The consultants get used to writing these reports, and it is almost just second nature now to say the same things.

Several other practitioners and reviewers remarked that repetitive report writing contributes to complacency and poor uncertainty communication, which then forces a re-working of the project

(because some consultants or practitioners view the original reports as inapplicable), lengthier time commitments, and increased expenses with regards to data collection, project information dissemination, and general implementation and decision progress.

Uncertainties associated with an EIS's *baseline studies* were a predominant theme that emerged from the interview data. Lack of historical baseline data (i.e., lack of proper ecological data) in the oil sands was a common concern among all consultants, practitioners, and interveners interviewed. For example: Intervener (1) argued that in order to figure out how much, if any, the tar sands operations are adding to contamination requires baseline data that they do not have, and “to a large extent that’s been deliberate.” Regulator (1) further observed that, “in the oil sands, unfortunately, with these mines there is a moving baseline and not enough knowledge about how the environment was before the mines.” The issue of uncertainty extends to how complete baseline studies actually are, and what scientific standards have been adhered to, as there is a general shortage of measurable targets and thresholds and standards.

Uncertainties found in the *scoping stage* were mainly related to the clarity of project planning and development. If there is a lack of capacity to meaningfully participate from any stakeholders involved in EIS development from the beginning, uncertainties can be amplified by improper or inadequate scoping. Uncertainties around features that demand assessment (e.g., uncertainties with the temporal and spatial boundaries, valued ecosystem components (VECs) for the area, and social-economic concerns) can be inadvertently bypassed through only brief consideration of these features. For example, Practitioner (1) noted that, “[The Ells River corridor] became something contested in the hearings because there was so much uncertainty around it. They could have avoided all that [uncertainty] by voluntary scoping the project rather than basing decisions on more economical criteria (to maximize their recovery of the resource). They could have taken other approaches to reserve that buffer.”

All interveners and the majority of practitioners and consultants (three of five in each group) indicated that because EAs are proponent-led, communication of risks is often limited, perpetuating poor understanding of uncertainties by other stakeholders. For example, proponents may not understand what should be assessed with regard to valued ecosystem components or socio-economic concerns. Respondents noted that if uncertainty arises due to poor understanding of the

project from the beginning, many conciliatory recommendations might be missed, producing greater uncertainty with respect to project outcomes.

More specifically, the baseline wildlife studies that were completed for the Joslyn North project were questioned with regard to species at risk, i.e. were the assessments completed appropriately? Practitioner (4) gave voice to a common concern expressed by three of the five practitioners: “I had uncertainties related to the degree of which the baseline assessment was done, which the EIS is based on: did they actually account for certain concerns that we had with respect to impacts on species at risk? So, did they do wildlife surveys and habitat surveys up to a standard that our policies dictate to ensure that species at risk were addressed?” The assessment of other ecosystem components and the assessment methods used were also questioned.

Uncertainty in the *impact prediction* stage of EA, especially with respect to overall prediction accuracy, was a concern expressed by 11 of the 19 (58%) participants interviewed. Consultant (2) spoke of uncertainties about the accuracy of prediction models used in oil sands EAs: “We always raise the uncertainty regarding modeling: the models have an inherent degree of uncertainty, and therefore you have to be careful on how you interpret those modeling results, but like most [project-based] EIAs it’s just predicted. And in theory, if you predicted accidents then you’re supposed to go back and look at how to minimize the sources of emissions that contribute to those.” According to interviewees, there is a clear gap between the potential impacts that are predicted and the reality of outcomes. For example, a majority of consultants mentioned that the models being used to help with predictions of wildlife impacts are not validated; yet they are still used. It was also noted that many of the models in use are simplistic and do not reflect the complexities of the natural environment.

All interview participants mentioned uncertainties related to *mitigation*. There is a reported need for the federal government to provide consultants and operators with clear expectations for mitigation. Most of the time it is recognized that certain impacts are more probable than others, thus more effort is spent designing mitigation measures for the most likely impacts. Aboriginal Representative (2) questioned whether mitigation measures are implemented and if so, effective “I think companies do offer up mitigation...hypothetically [they] will deal with [problems] when [they] happen, or [they say] ‘we’ve got this policy in place so it must be mitigated.’ [Even] though mitigation policy itself has never been evaluated or deemed effective on the ground.” Gauging

whether the impacts from oil sands mining are acceptable or not, cannot be achieved without understanding how effective the mitigation measures are or have been in past projects. Currently, the proponent will identify potential environmental effects, then identify the mitigation measures, and finally estimate the residual effects based on implementing the mitigation measures. Therefore, the mitigation measures are supposed to deal with any uncertainty; however, all participants have made comments regarding their uncertainty about the mitigation measures themselves (e.g., how effective they are). For example, one regulator noted that the primary means of mitigation in the closure plans for projects such as Joslyn North is land reclamation. Commitments have been made to bring back the land to equivalent capabilities after impacts, but there is uncertainty about the meaning of “equivalent land capabilities” (Practitioner 4 and Regulator 1) (i.e., after reclamation and conservation, the land should support various users and be similar to pre-development conditions) among 11 out of 19 (58%) of the participants:

My general impression would be that Total E&P Canada (TEPCA) presents information in such a way in the [project-based] EIA and in the approval amendment that identifying uncertainties is not the priority of those documents.... Therefore, the mitigation measures are supposed to deal with any uncertainty, but there is a lot of stuff we don't know yet about the mitigation measures. For example, [TEPCA] did a really terrible job at addressing peat land reclamation. They don't even have it in their EPEA amendment application and the reason that they didn't put it in there is because there is so much uncertainty around how to re-establish functioning peat lands after mine disturbance. (Consultant 3)

In the Joslyn North case in particular, one consultant mentioned that, “The technology to reclaim peat-accumulating wetlands for large-scale commercial application does not currently exist” (Deer Creek, Joslyn North Mine Project SIR responses 2007: 24). Therefore, there is a significant uncertainty about whether future mitigation from mining disturbances will actually be achievable.

Nearly all interviewees who were intimately involved in the Joslyn North project (17 of the 19 participants; 89%) clearly observed a change in project dynamics once TEPCA took over from DCEL. Subsequent to this change, the stakeholders' general understanding of the project plummeted:

I think the concerns regarding uncertainty were always the ones we were talking about because on this case most of the work done for this project is not in the [project-based] EIA process, it's in the regulatory process,



which is the reason why this project is a little bit of a strange one. In the EA process, the project that was analyzed was not the project that has been approved under regulation right now: they are two very different [projects]. (Regulator 2)

Even though TEPCA completely redesigned the project when they bought it from DCEL, the EIS that was originally completed by DCEL was deemed complete by the review team, though the EIS did not necessarily assess all aspects of the newly redesigned project. Therefore, uncertainties related to the newly designed Joslyn North project needed to be identified during the regulatory process (i.e., hearing and supplementary information requests) as there was no opportunity to complete a new EIS. It was difficult for stakeholders to understand what had changed, and so pinpointing and addressing uncertainties was doubly difficult for them. The panel hearing took the place of a ‘new’ EA process (reopening the EIS was not an option because it was already approved to go to hearing) and, therefore, the panel hearing became very important.

The majority of consultants interviewed—three of five—noted that during the hearings, panel members were not keen to hear about uncertainty, as uncertainty tends to make hearing processes more complicated. On the other hand, two of the five consultants noted that general approval conditions for the project were already quite rigorous, and that certain levels of uncertainty were acknowledged by putting in place fairly stringent terms and conditions for operation of the mine. For example, Regulator (1) felt assured that, “the uncertainties that are well-known get a lot of attention and research, and reviewers get involved in the research and try to figure out if the research is adequate.” According to Regulator (1), if through the hearing process new uncertainties come to light, or if decision-makers want more clarification, the onus is upon them to elicit that information. Even so, all of the interveners cautioned that important discussions are sometimes circumvented and, in fact, some information is not considered at all. Intervener (2) went so far as to say that proponents were “not having a proper discussion about what the potential impacts could be, let alone whether they could be mitigated.” The interveners felt that not enough public participation is encouraged in EA, which could result in uncertainties being missed or avoided. One practitioner even commented: “If stakeholders and the government had complete knowledge of project effects, they might not approve projects.”

#### *4.1.2 Lack of Integration of Aboriginal Concerns in the Assessment*

All Aboriginal and Métis people representatives and consultants interviewed agreed that integrated assessments including Aboriginals concerns are inadequate in recent oil sands EAs. Yet, uncertainties around impacts such as noise, odour, road construction, truck fleets and so on, intimately involve the communities living in close proximity to the mines. According to one consultant, land users are perceived as wanting more certainty regarding land reclamation and the right to exercise their aboriginal and constitutional rights; they would like to be a part of EA processes in which the proponent shows commitment to mitigation plans that would accomplish reclamation of functioning ecosystems.

All Aboriginal representatives and consultants insisted on a greater time commitment from the proponent for the consideration of future impacts from the communities' points of view, using community-based criteria. As Consultant (5) explained, all interviewees felt that an meaningful integration of Aboriginal concerns would produce more meaningful conversations about the assumptions behind mitigation measures, and about the management of uncertainties around such assumptions: "If communities cannot engage in the EA process, how can they meaningfully understand what the project impacts are going to be? And therefore make decisions based on that? Ideally, a negotiation should happen at the table where the Aboriginal community has the same understanding of the project as the company, or similar...at least have the capacity to read it or understand it." The perception from the interviewed Aboriginal representative is that operators say they will consider traditional knowledge (TK) in their development plans, yet that has not been consistently demonstrated.

Aboriginal Organizations often hire consultants and other experts to assist them in understanding and some Aboriginals have the capacity to participate in assessments in a very sophisticated and deliberative way. Still, due to experience with traditionally infrequent lack of engagement, most Aboriginal communities cannot always meaningfully understand what the project impacts are going to be. Consultant (5) explains the problem in the following manner: "...because the [EIS development] is proponent-led, the risks are often limited, or you have a very rosy picture and many of the communities or NGOs don't often have the capacity to fully review the project. So, risks aren't fully understood." Moreover, when Aboriginals communities participate in hearings, they are making arguments in terms of lived experience and traditional

ecological knowledge that are being heard, but not listened to or respected. Aboriginal Representative (2) frankly comments based off of experience: “ The socio-economics are really not well addressed in any of the regulatory bodies here in Alberta; it leaves a gaping hole. [Social Assessment] ends up being a statistical analysis of demographics, salaries and crime rates... not a lot of integration of social or cultural impacts and consideration into the processes; no recognition of TEK, and very little weight being placed on how traditional land use will change...integrated assessments are very shallow from our experience.” These idioms and epistemologies are honoured in law but not in practice. Currently, EISs are written largely according to western scientific standards, using scientific jargon, and proponents do not ask Aboriginal communities to identify their own key issues.

#### *4.1.3 Regulatory Process Integrity*

While inadequate consideration of Aboriginal and Métis Peoples concerns in the assessment is a particular area of need, data revealed that uncertainty within the wider regulatory process (approval system for energy development projects in Alberta) is also a concern. Two of five of the practitioners view joint-panel recommendations as well thought-out, but in practice, most of the recommendations are non-binding, rendering them largely ineffective. These practitioners commented that many projects are never fully mitigated because the recommendations are not mandated for implementation. For example, in the Joslyn North case, a considerably large setback<sup>4</sup> from the Ells River Valley for at risk bird guild species was urged by the panel, yet the Albert Government decided against implementing the recommendation. Biologists suggested at 300 m setback, but this recommendation was ignored and instead a much lesser setback was implemented (100-150 m). Regulator (1) summarized the decision: “In the decision report, a setback is recommended and when it got to the province, the province ignored

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<sup>4</sup> Alberta Sustainable Resource Development, Fish and Wildlife division define a setback as a guideline “to manage the timing and location of human developments and resource extraction activities in ways that minimize adverse effects. Activities that cause a lasting physical alteration to vegetation, soils, and surface/subsurface waters are of particular concern... setback distances are based on what experts believe are the thresholds at which human disturbance is likely to cause degradation and possible abandonment of key wildlife areas/sites” (Alberta Government, 2011: 1, 3).

the recommendation to have a setback based on the company's conclusion that if they put in a setback the project would not be economical." Occasionally a separate proponent-led mitigation ends up in approvals and is implemented by the company themselves, but still the practitioners' experience emphasizes that few recommendations actually translate into meaningful government policies (e.g., conditions of the approval).

A little over half of the participants (11 of 19; 58%) agreed that regulators acknowledge uncertainty in the assessment by putting fairly rigorous terms and conditions for subsequent operations, but whether the terms and conditions are actually enforced is difficult to say. Two of three regulators (66%) stated that most commitments made in the EA (that are not written into an approval clause) are not enforceable. Most of the participants (14 of 19; 74%) recognized this flaw in the regulatory process. As a result, organizations such as CEMA were created with the intention to develop guidelines and management frameworks to enable companies to meet particular approval conditions that were set as part of their EA filing.

Ten of 19 (53%) participants made mention that the perception in Alberta regarding projects such as the Joslyn North case is that approval will be granted regardless of the advice, recommendations, or information provided by stakeholders: Regulator (3) articulated this perception: "Well, I think we all know going forward that the projects are going to be approved. So, I don't think any of us have any expectations that these projects won't get approved. So, we just have to provide our best advice so that they can understand what the impacts are of them making the decisions." Such perceptions further perpetuate distrust in the EA process, and Aboriginal and Métis representatives are not the only stakeholders commenting on such biases. Three of five practitioners interviewed communicated their frustrations with the absence of a legal requirement for the Alberta Government to attend panel hearings. The uncertainty in the process then is amplified by perceived weaknesses in the Alberta regulatory systems. Regulator (2) mentioned limitations even in the supplemental information request process: "Supplementary Information Requests (SIR) allows you to put your uncertainties on the table, and [the uncertainty] is available to anybody who wants to see that...Unfortunately, what I'm seeing more is that we are limiting our information requests. So I've been told two or sometimes three [SIRs] only and I'm not sure why, maybe it's related to the timelines associated with the process." Alas, this limit of SIRs can manufacture distrust and present a level of discrimination within the Alberta approval

system (e.g., some information is not considered with the weight it deserves because it is not valued by all stakeholders in the same manner).

Another source of uncertainty embedded in the regulatory process are *Policy Limitations*. One consultant perceives industry as being “fearful that new policies will negatively affect their operations and the way that they do business.” Several participants (12 of 19; 63%) commented that government planning and the will to implement appropriate environmental standards are not strong enough to negotiate with multi-national companies - companies that prioritize profit over environmental issues in exchange for wealth, development and jobs:

A key area of uncertainty is – ‘Where is the limit [of development]? Are you approaching the limit?’ If the government hasn’t set the limit yet, it’s completely uncertain. But, we know we’re approaching [the limit], and in many cases we might be exceeding it. But, there is no willingness from the government to [set the limit]. In the TEPCA case, from a negative sense, we actually think the proponent created more uncertainty by ignoring clear rules that had been produced through CEMA. They are kind of masters at developing subjective scoring systems in order to come to the conclusion that there are no significant adverse impacts rather than using the available data. (Intervener 1)

These participants questioned the pace and scale of these projects as without strict enforceable policy and legislation there is no limit to the number and the size of projects that can be built.

Another problem within the regulatory process that was mentioned by all interviewed consultants and interveners is the *time frame* in which EAs are completed. Generally, the bigger the project the longer the time horizons and the more uncertainty there is, yet there is only so much time provided for review of the EIS. Participants questioned whether or not the reviewers and decision-makers are getting the time they need to understand all of the uncertainties - separately, and interactively. Moreover, it was mentioned by two of five practitioners, two of five consultants, and one of two interveners that lack of understanding of uncertainties in the EA development time frame can contribute to cumulative impacts in relation to overall pace of development in the AOS area.

Lastly, 13 of 19 (68%) of participants revealed that uncertainties could be amplified in current EAs because they lack *project-specificity*. Projects are all somewhat different (i.e., different stakeholders, location, environment factors, VECs etc.) and the impacts could be very different depending on the mine/project. Environmental Assessments (EAs) should be completed more on a

project-specific basis (i.e., specific input entered into models based on the spatial and temporal area of each mine). This way appropriate mitigation and monitoring can be applied prescriptively as is implied by Consultant (3): “[Assessments] should also be on a case-to-case basis depending on that particular project. This way the mitigation can be discussed, as well as the potential outcomes of the project. The language that is used now to communicate uncertainty is ‘likely’ and ‘unlikely’ and this language is not refined enough to understand the residuals of a project.” Standards and/or assessments are uniform regardless of the size of the project and impending impacts. This unspecific approach will be further discussed in this chapter with reference to the Joslyn North case.

## 4.2 UNCERTAINTY DISCLOSURE, CONSIDERATION, AND AVOIDANCE BEHAVIOUR PRACTICES

This section outlines results related to uncertainty disclosure, consideration, and avoidance behaviour practices in the Joslyn North case specifically, as well as the EA process as a whole (rather than aspects of EA itself as in the preceding section).

### *4.2.1 Approaches to Communicating About Uncertainty*

All participants in this study agreed that communication about uncertainty in current Canadian EAs is flawed, but perceptions regarding solutions vary among stakeholder groups (Table 4.1).

**Table 4.1:** Disparate perceptions of communication of uncertainty regarding the Joslyn North case EA. Note: the consultant group in this study did not include any consultant that worked with the proponent, the majority worked with Aboriginal Organizations.

\* All percentages refer to the proportion of “yes” responses received in answer to the question posed.

<b>STAKEHOLDER GROUP</b>	<b>Were you satisfied with how uncertainties were dealt with?</b>	<b>Did they openly communicate it?</b>	<b>Was enough uncertainty information shared?</b>	<b>Was uncertainty used in the EA process?</b>	<b>Need to improve uncertainty communication</b>	<b># of interviewees intimately involved in JNM case</b>
<b>Practitioners</b>	80% *	100%	80%	60%	40%	All (5)
<b>Consultants</b>	0%	100%	40%	40%	100%	All (5)
<b>Aboriginal Reps.</b>	33%	100%	33%	0%	100%	One of three
<b>Interveners</b>	100%	50%	0%	50%	100%	All (2)
<b>Panel Member</b>	100%	100%	0%	100%	100%	All (1)
<b>Regulators</b>	66%	66%	33%	100%	100%	All (3)

It is important to note that although a stakeholder group may be identified in Table 4.1, this does not imply unanimous agreement but rather agreement of a majority. Some participants were unsure, or preferred not to give a definitive answer, while others had caveats to their answers. For example, eight of 19 (42%) noted that uncertainties were communicated, but reduced or downplayed. The majority of participants (10 of 19; 53%) stated uncertainty communication was done to the best that the regulatory tools allow, but more could always be done given the better tools (i.e., time, financial support, human support and so on). Lastly, two of 19 (10%) noted that given the right tools, communication could be improved, but are unconvinced that improvements will ever be possible within the current regulatory system within this case and within EA generally.

With respect to the day-to-day mine operations, the majority of participants (11 of 19; 58%) note that uncertainty communication is adequate as there are strict rules and compliance regulations set into place. Additionally, 17 of the 19 (89%) participants have observed positive uncertainty

communication practices and have noted that some professionals and companies who have decades of experience go above and beyond assessment requirements. Many participants (15 of 19; 80%) reported that TEPCA was open about uncertainties they had. For example, one consultant stated “[TEPCA] were fairly progressive with their philosophies, and when concerns were raised, they tended to look at ways to address the concerns as opposed to looking at ways to get it off the table right away.” The interviewed panel member as well as the majority of practitioners and consultants (three of five for both groups) stated that most of the high-risk uncertainties (the really crucial uncertainties, i.e., severe risks to human health and so on) that were of concern were addressed by TEPCA. Eleven of 19 participants (58%) said that the EA completed by TEPCA was notable in its thoroughness, and this was echoed by Regulator (1): “This [project-based EIA] was very comprehensive, one of the best EIAs that I have seen completed to this date, and everything was very open. The panel would ask the staff anything they wanted and vice versa. [It] was a very good review process by [TEPCA].”

Still, a majority (14 of 19; 74%) of participants noted that information regarding the range of uncertainty was *not* openly shared by TEPCA, and there were some previously hidden uncertainties presented after project approval. For example, project approval was based on the DCEL EIS which stated that 61% of the landscape would be reclaimed by the end of mining activities in 2037 (Total E&P Response to Information Request from Oil Sands Coalition 2010:13), and that no more than 5000 ha would be disturbed at a time (Report of Joint Panel, 2011: 51). However, after mine approval, an amendment was requested by TEPCA for an increase in the peak net disturbed area to 6650 ha. This was accompanied by an explanation that some facilities that were originally agreed to be fully reclaimed before closure would no longer be fully reclaimed in the modified TEPCA project, as these facilities will still be used for operations (Total E&P Canada, AER amendment application 2013; 14-1). This discrepancy suggests a lack of transparency since communities supported TEPCA agreements based on the original reclamation plan.

Indeed, the data revealed that 10 of 19 (53%) participants (mostly participants and consultants), perceived EAs to be written in a way that presents uncertainties as limited. The EAs were perceived to hide potential effects, and to be less than transparent about complications, thus permitting industries to operate based on minimal mitigation. Consultant (4)’s comments are blunt: “I really don’t think the uncertainties are communicated strongly enough...there’s an overall



attitude that we can develop these mines, and we can fix it after. I think uncertainties are downplayed, it is almost portrayed as if we can take all the trees off the land and then dig up the bitumen, and then we can lay it all back together and fix it back to the way it was; it's almost portrayed as that being factual." This underestimation of the effects that these mines will have on the environment was raised on multiple occasions. Nevertheless, these 10 of 19 participants state that there will always be some uncertainties that even with the best system in place the proponent will never been able to anticipate.

#### *4.2.2 Levels of Uncertainty Considered in the Assessment*

Both CEAA and CEAA 2012 require a precautionary approach when considering environmental effects. In the Joslyn North case, 5 of 19 (25%) interviewees suggested that the panel could have taken a more precautionary approach, specifically with regard to species at risk.

Practitioner (2) critiqued that "Impacts to species at risk are something that you cannot condone as being traded off, and that is something written right into the preamble of *Species at Risk Act 2002*. Unfortunately, is it up to the proponents to adopt that stance at their own discretion." The panel Member responded by saying "TOTAL noted that in the literature it reviewed, 30 per cent residual habitat was sufficient to avoid rapid declines in population. TOTAL therefore claimed that using 60 per cent residual habitat was precautionary" (Report of Joint Panel, 2011: 44). Ten out of 17 (58%) respondents who commented on precaution noted that the proponent did an adequate job using the precautionary principle. Three of five practitioners supposed that the proponent probably could have taken a more precautionary approach around the concern of the Ells River corridor (a wildlife movement corridor). In fact, all Aboriginal and Métis Representatives interviewed stated that they have no confidence in industry as a whole, but believe that some individual operators perform much better than others: "You have your good players and your bad players," said Aboriginal Representative (2), "and the good players are always trying to find your ways through issues and mitigate them, but there seems to be a lower standard that is being set by Alberta now and so some companies are not as willing to mitigate impacts." According to the interviewees many operators are willing to mitigate potential effects just by meeting Alberta's standards, which is really not mitigation at all according to these representatives, rather

it is what operators are required to do by law. Aboriginal People's and Métis Peoples expect a high degree of environmental performance that may not be required from a provincial standard.

All the practitioners interviewed revealed concerns about ensuring that potential impacts are made explicit to the panel. To this end, practitioners noted that decision-makers and panel members must receive relevant information in order to make an informed decision. Unfortunately, because there is so much paperwork to be submitted during these trials, some uncertainties are deemed less important; therefore, not every uncertainty gets built into each submission to the panel. For example, Consultant (1) remarks, "Well uncertainty is something that [the panel] didn't want to hear anything about. It just makes their life more complicated, so they were not so keen on hearing about uncertainty and it was a little frustrating in fact." The interveners that participated agreed with Consultant (1), and reiterated that understanding the level of uncertainty is critical to figuring out if an effect is significant and if the project should go forward.

Because of the amount of information synthesized in EAs, the stakeholder level of satisfaction with the assessment often becomes a test of reasonableness and comprehension. There is a trade-off between the quality of information and the quantity and manageability of information. With regard to Joslyn North, two of five consultants, two of five practitioners, and all three regulators agreed that a reasonable effort was given by the panel in its mandate to understand the different aspects of uncertainty, and a reasonable effort was made in the practitioner's submission in recognizing uncertainty.

The majority of practitioners interviewed (60%) noticed that some uncertainty is created because the proponent does not fully understand what is being asked of them in an EA. There will always be inherent uncertainty in an EA because the project being proposed is still in the planning stages (i.e., detailed engineering has still not happened). Consequently, answers to certain questions are unavailable because there is still uncertainty regarding the exact plans even until after complete approval. "There is an uncertainty created," said Practitioner (1), "when a proponent does not understand what the regulator wants and vice versa ... Then it's up to the system to provide guidance as to what is expected for level of details." All consultants interviewed and the majority of practitioners (4 of 5) stated that they are open about the inherent or found uncertainties during an EA, especially because communicating such uncertainties provide them with credibility. "I think you come across being more credible if you are communicating uncertainty," said Practitioner (4).

“I don’t think anyone thinks that anybody knows everything, but if you come across as pretending to know everything then you lose credibility.” This view was common among the interviewees; however, one of the interviewed consultants noted that often uncertainty can be interpreted in an “industry friendly manner,” and used to justify decisions inappropriately as opposed to admitting that some things are unknown. In other words, credibility can be lost in an EA process if it is presented dishonestly. Industry and government are perceived by the majority of stakeholders (13 of 19; 68%) as being fearful of the uncertainty being communicated, so the risks are often presented as more limited than they really are.

#### *4.2.3 Risk Communication and Risk Acceptability*

Companies who are fearful of communicating any negative effects truthfully and openly leave little room for dialogue, which means an already adversarial process becomes more adversarial. Three of five consultants perceive that regulators determine the acceptable level of impact and risk to an area and/or public, and then they try to offset impacts by increasing public benefit. Consultant (2) reflected though, that they were deluding themselves to think “that anyone is going to bear long-term liability other than those people that live closest to [the mine] and the tax payers of the province. The people who are taking the benefit are the shareholders and the company; they’re not bearing the long-term liability.” According to the interviewee, regardless of regulators’ efforts or assurances, developments always favour private entities over public. The view that the project benefits are for the shareholders and industry over the public was common among interveners, consultants, and Aboriginal representatives. The consultants suggested that regulators should base their decisions on risks instead of on supposed economical benefits for Albertans and Canadians:

It’s really important that people know that when we’re making a decision, we are always going to be taking a risk. It’s usually an informed risk, but there is always a risk with whatever decision you are going to make and uncertainty plays into that. And so, the more that people are aware of where these uncertainties lie, I think the better decision you end up with because the decisions can include actions that compensate for the uncertainty. (Practitioner 5)

Most of the participants (17 of 19; 89%) noted that when uncertainty and risk are mentioned the public automatically assumes a worst-case scenario.

Clearer communication about the meaning of *risk* is required so that discussion about uncertainty can occur without vehement feedback from the public. Truly, as the majority of regulators (three of five) outlined, current approvals and mitigation are already largely based around risk management: long-term pollution risks (and the environment's ability to assimilate contaminants) are paramount in the EA process so that wildlife and people are not unacceptably affected in the future.

All participants interviewed understand that the proponent is likely to still take risks even if there is a probability of negative consequences. Residual effects must be well managed. For example, the panel accepted that there were many risks associated with the proposed SAGD thermal operations. One participant mentioned that when the reviewers established the SIRs for Joslyn North case, the responses to many of the questions were oblique or inadequate, such that in the end, neither the effects and/or the mitigation were clear, yet the project was still accepted regardless of risks meaning that the province of Alberta is willing to accept the risky decisions when the economic benefits outweigh the *potential* negative impacts.

#### *4.2.4 Monitoring Uncertainties*

There was a perception among stakeholders that the government of Alberta had a system set up to receive information, but there was no political intent or will to address any problems or monitoring the outcome(s) of the project. The federal government often manages monitoring through a budgetary process, and as Consultant (5) noted "...all these projects are going forward and the only thing they are going to have left is monitoring to find out what the impacts are, and taking the measures necessary to deal with those impacts. But there's a fear that the monitoring going forward is driven not from a scientific perspective, but from a financial perspective." Monitoring is essential for identifying impacts and appropriately addressing them. A lackadaisical approach to monitoring and a potential avoidance of proper monitoring (out of fear that impacts become more publicly known) was a concern of many participants (9 of 19; 47%). Furthermore, much of the current monitoring is geared toward an international audience where concerns such as global greenhouse gases take precedence, whereas local communities are more concerned with uncertainties around odours, access management, land use, and noise. Aboriginal and Métis communities also fear that the current monitoring in oil sands is driven by financial considerations rather than scientific or environmental ones. For example, the interviewed interveners attest that

the Canadian federal government is managing monitoring through a budgetary process as opposed to what is needed environmentally.

#### *4.2.4 Uncertainty Disclosure and Avoidance Practices*

Due to the sheer volume of EISs, there is a good possibility that many stakeholders do not get the opportunity (or have the capacity) to understand uncertainty deeply:

Many of the people who end up reviewing these EISs may or may not get past the introductory levels. Maybe they get past the executive summaries, but I think there is very few people who get the opportunity to drill down very deeply into the report and actually get at some of the details, at the very back of the reports so to speak and I think it is a very difficult thing to do just because of the sheer volume of these documents, so I am not actually sure the ideas and the uncertainties are necessarily laid out as clear as it should be. (Consultant 4)

The majority of consultants (4 of 5) noted that uncertainties are perceived as being buried deep in the appendices of an EA, in effect, diluting them. For example, Consultant (4) states, “many times it would require going through layers of information to actually get to that statement. [Uncertainty] is not often up front, it is in appendix 27 or something like that. It’s quite deep down in the reports.” Therefore, the current way of finding out about uncertainty is usually during the hearings and SIRs when discrepancies are noted in the information that is being presented.

Four of five consultants and two of three (66%) regulators mentioned that industry and government are defensive and fearful that if uncertainty gets communicated, the project will be cancelled. Rather than openly talking about the risks along with the benefits of projects, projects are claimed to have no risks or adverse environmental effects. “The regulators want to minimize uncertainty,” said Consultant (1), “as do the proponents as it’s in their best interest to downplay it, minimize it, and often try to cover up the uncertainty. They stop short of fundamentally lying about it, but they are doing their best to bury it or just stay silent on it.” Clearly results show that some stakeholders and affected interest groups emphasize that they have zero tolerance for any potential negative consequences. They assume worst-case scenarios, which cause the proponents to feel as though they have to speak in absolutes. For example, a panel member comments that, “proponents and consultants are absolutely terrified of using the words significant adverse effect. And that has done in my view a lot of damage to the impact assessment process because people won’t call a

spade a spade.” Proponents think delays will occur if stakeholders are looking for information or are wondering if information is being hidden or is incomplete. A lack of transparency then creates a level of mistrust, and stakeholders begin to wonder what else is not being shared. As a result, oftentimes stakeholders do not have meaningful discussions about how uncertainties can be mitigated.

The term *uncertainty* has itself different meanings. The perception of 16 of 19 participants (84%) is that proponents do not want to use it because its different (fearful) connotations, and tend to use more euphemistic words such as *magnitude* or *frequency* in its place. One intervener stated that, “from the proponent’s side, possibly disclosing uncertainty is a double-edged sword. Will companies get more credibility by communicating more honestly? They might not. It’s easier to hide risks rather than acknowledge the risks and I think that’s what happens in the oil sands.” Proponents might not gain the desired credibility or social licence if they speak freely about uncertainty, yet all Aboriginal representatives (who were not Aboriginal peoples themselves) remarked that the more transparent and accurate predictions are, the more realistic stakeholders can be when using EAs or SIAs as a tool for proper planning and mitigation:

[Uncertainty] should not be always be feared by the proponent as something to block their regulatory approval, and I think that’s where a lot of hang ups with some folks in the oil sands are. [The proponent] will look at it and say, ‘You know we can’t put this information in the [project-based] EIA cause then they will use it against us,’ but I think that’s where a good [project-based] EIA can help you realize where those potential impacts were so you’ve got a plan to deal with them in case they arise. I think where you get other folks that look at [uncertainty] and say, ‘Well if we put that in there we are admitting that we are going to have impacts, and that means the regulator won’t approve our project and then we will lose our assets,’ and I think that’s the disconnect. (Aboriginal Representative 2)

Every consultant interviewed agreed that when all stakeholders know about the degree of uncertainty, concerns about decision-making can be articulated more knowledgeably, and with uncertainty being addressed in the project approval process, the proponent can achieve their desired social license. Injecting more honesty into EA would demonstrate that proponents are aware and educated about uncertainty within their project and are openly considering it.

## 4.3 CONTEXTUAL FACTORS THAT INFLUENCE UNCERTAINTY DISCLOSURE, CONSIDERATION AND AVOIDANCE PRACTICES

### *4.3.1 Project Conditions*

Many contextual dynamics in the Joslyn North case may or may not have contributed to uncertainty disclosure, consideration, and avoidance practices. The relationship dynamics within the project were different from other oil sands projects due to the change in ownership that took place. Regulator (3) reflects, “The regulatory process does not follow the standard steps because of the changes in ownership and design that took place midway through the regulatory process. It just added so much complexity, and by default so much uncertainty to the project.” Clearly there was some uncertainty information in the EA, but not sufficient amounts for the newly redesigned project. The hearing took the place of a subsequent EIS because the DCEL EIS was approved already. Still, Practitioner (5) questioned “How do those [project design] changes affect the predictions and also the uncertainty of what happens in the future with other factors that may not have been considered?” This participant feared that uncertainties might be missed or their communication to be minimized if they were not raised during the hearing process.

All practitioners, regulators, and the panel member interviewed deemed the federal and provincial relationship very important in this case, specifically with regard to wildlife. The scope of species at risk information and the assessment of species at risk impact is determined by the federal-provincial relationship. Problems are created if there is disagreement about information requirements. These disagreements can be looked at as uncertainty avoidance practices or minimization of mitigation. As Practitioner (1) states, “The big thing is for government to be able to clearly specify what the expectations are so it’s clear for everyone what the effects would be and if mitigation would result in acceptable effects.” In the Joslyn North case the provincial regulating bodies did not come to the hearings meaning their expectations could have been minimally considered or even missed.

Other questions arose about whether federal panels have the ability to consider impacts to constitutionally Aboriginal/ treaty rights and whether consultation with these Aboriginal People has been meaningful. It was mentioned by a Aboriginal Representative that treaty rights are outside of the panel’s jurisdiction and cannot be considered in hearings. Fort McKay had a strong agreement with TEPCA that they were comfortable with. The Aboriginal and Métis representatives

observed that the environmental mitigation was fairly strong, and the company really tried to address community concerns. The community engagement during that time probably could have been improved, but as noted by Aboriginal Representative (2) the approach that the company took was healthy: “[Fort McKay] has a great relationship with the company. There is a high degree of trust between the operator and the community. [Fort McKay] had an opportunity to review the approvals for TEPCA. So [Fort McKay] had an opportunity to provide input on a number of different specific pieces, as well as the overall picture.” When companies have strong relationships with communities they often come into agreement with them pre-hearing. The panel member for the Joslyn North case noted that many groups came into agreement with TEPCA before the hearing. For example, the Mikisew Cree and TEPCA came to an agreement and therefore Mikisew Cree withdrew their questions on constitutional law in relation to the project.

It is often the politics of a situation that can instigate an increase in uncertainty avoidance, and frequently jurisdiction dictates what regulators can or cannot say. For example, regulators interviewed for the Joslyn North case mentioned that they wanted to recommend a wildlife offset, but they perceived that such a recommendation was not acceptable for individuals in their position. Their reticence springs from a political source and may support the notion that the governments are fixed on the resource development rather than on environmental and social considerations.

#### *4.3.2 Wildlife Considerations*

This research shows that 13 out of 19 (68%) participants identified uncertainties associated with wildlife and species at risk and their critical habitat. As Practitioner (2) notes, “one of the things that was interesting about the Joslyn project is that it was one of the first panel reviews that we have participated in that featured primarily species at risk and their outcomes.” This generous opinion was not shared by everyone, but was held by many. To aid in preservation and the protection of wildlife and species at risk, the *Species at Risk Act* 2002 is called on in situations where major projects are proposed in order to provide some direction. Section 58(1) of the act states that “no person shall destroy any part of the critical habitat of any listed endangered species or of any listed threatened species — or of any listed extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada” (*Species at Risk Act* 2015). Though this law states that critical habitat cannot be destroyed, there is no clear federal definition specifying what critical habitat is. Yet, mitigation for wildlife often calls for habitat descriptions.



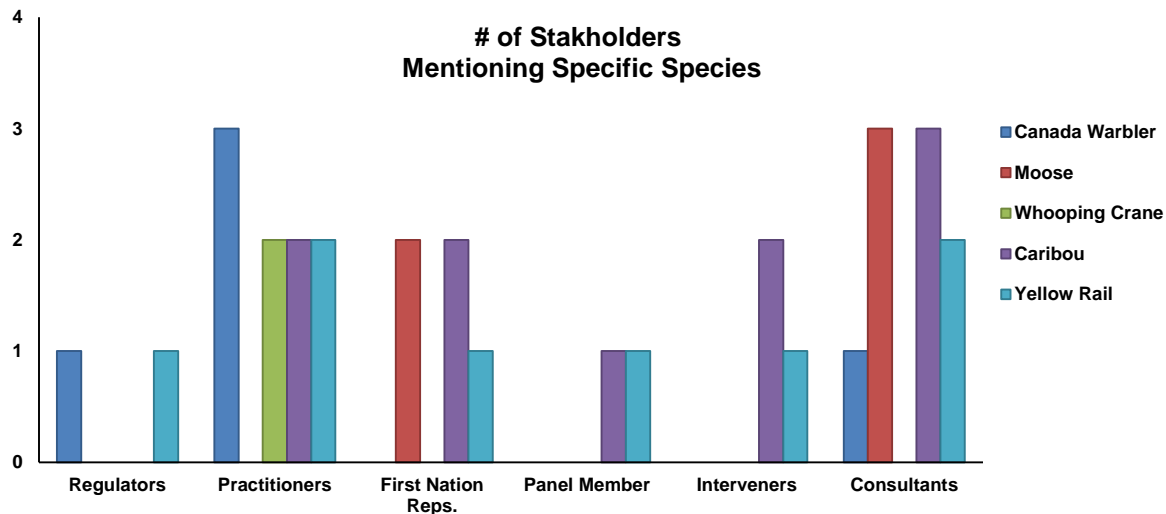
“EC is of the view that specific habitat requirements of species at risk in the region must be understood and considered in order for reclamation prescriptions to successfully replace habitat for species at risk destroyed by this project” (Addendum to submission of Department of Environment regarding species at risk, 2010: 2c). As Practitioner (1) attests, there has been no study to establish what critical habitat is or how to measure it: “Exactly what habitat is required for each species is not defined...or required for species around. Some federal biologists recommended a minimum 300m setback. This caused the company to lose key resources, so the province decided that it was in the public interest that [the setback] be ignored.” The requirement to have a significant setback from the Ells River Valley habitat for the SARA bird guilds<sup>5</sup> was recommended by the panel, but the provincial government and TEPCA declined to implement it; moreover, without clear legislative rules for setback requirements and without a description of critical habitat the recommendation was easily declined.

If TEPCA had implemented the setback, reduced resource recovery would have been the result. Practitioner (2) confirms that “[the company] wants to maximize use of the resource and access to it and the bitumen came very close to the river’s edge, or to the edge of escarpment where it comes down into the river... but [this area] also had some habitat for some threatened species.” Stakeholders (12 of 19; 63%) noticed that the company was ignoring this recommendation and noted that it is common for the provincial government to ignore the panel’s recommendations on mitigation requirements. Regulator (1) observed that “the requirement to have a significant setback from the Ells River Valley habitat for the SARA bird guilds was recommended by the panel, and AB decided against implementing the recommendation by the board.” The majority of participants (13 of 19; 68%) agreed that the lack of enforcement of recommendations, measurable criteria, and standards written into legislation make it difficult to make decisions about the acceptability of impacts or to propose appropriate mitigation. The EA process is structured so that in order to mitigate the impacts to an acceptable level, one would need measurable standards. For instance, the effects on SARA bird guilds are unknown until their critical habitat is defined. There is a lack

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<sup>5</sup> Guilds are groups of species in a community that exploit the same set of resources in a similar manner (Simberloff & Dayan, 1991).

of empirical evidence of what would constitute as a suitable standard for wildlife corridors and setback requirements.



Wildlife habitat connectivity and the implementation of a wildlife corridor was also an issue in this case according to 13 of 19 (68%) of the participants. There was debate about the Ells River Valley and the chance that it was a movement corridor providing connectivity for various species of wildlife, but as Regulator (1) comments, “There were no setback regulations to follow because the evidence and the baseline information was from the sixties and was looking back at other mines.” One regulator suggested that TEPCA did a fair job of assessing the corridor suitability considering that the baseline data they were working with was out of date. “The panel notes that there is uncertainty about an appropriate mine development setback from the Ells River to allow a wildlife corridor around the project and that there is uncertainty about using the Ells River valley as a wildlife corridor” (Report of Joint Panel, 2011: 45). The Ells River Valley is very steep for wildlife travel and potentially dangerous habitat corridor, and habitat requirements for each species are not defined. Regulator (2) contested that “it wasn’t clear whether [TEPCA] allowed for enough of a setback from the escarpment.” The Ells River Valley is important to some SARA bird species like the Canada Warbler (a threatened species), and setbacks are considered important to maintain nesting areas (Figure 4.2).

**Figure 4.2:** Mention of specific species by stakeholder groups. Note Caribou and Moose were discussed in relation to oil sands development generally, whereas the bird species were mentioned more specific to the Joslyn North case.

Total E&P Canada utilized models to aid with the impact prediction of noise effects and “other sensory disturbances on species... For each species at risk, TOTAL provided maps indicating where the high, medium, and low quality habitat occurred in the local study area” (Report of Joint Panel, 2011: 30). There was notable discourse regarding the uncertainty of noise effects that the facility would have on non-nesting birds (studies done on SARA and *Migratory Bird Act* species only). As noted by Practitioner (4), the panel attempted to understand the potential indirect effects of noise: “There was uncertainty on what effects the noise, dust and activity would have on the threatened Canada Warbler. Total E&P Canada knew that [the Canada Warbler] would be there, so there is always some uncertainty even in the science side of it... With indirect effects, like sounds, there’s less certainty than when you are cutting trees down. So, I think there is probably more uncertainty about the indirect effects of a project.” During the panel hearing, it was decided that some of the nesting areas would not be directly impacted, but the impacts of sensory disturbance would cause habitat interference and avoidance.

Habitat models are often used to predict impacts on wildlife species (e.g., RSS model or a Habitat Suitability Index (HSI) model). Theoretically, most models would be acceptable to practitioners if validated, but many are not, so their predicative capabilities are fairly limited. As noted in the literature, “insufficient information is presented to assess the validity of the models used to calculate habitat availability” (Addendum to submission of Department of Environment Regarding Species at Risk, 2010: 2b). Participants also noted insufficient information as Practitioner 2 stated, “Because everything is built on models, there’s always some uncertainty.” Moreover, decisions concerning impact significance are potentially flawed as there is uncertainty at the base level of these models (i.e., with model development and input parameters) and so errors in the model inflate the uncertainty around the final decision-making. The research backs this premise as the majority of participants (12 of 19; 63%) referenced uncertainties related to inadequate sample sizes (input parameters) and model validation. Practitioner (5) commented on this:

We were concerned about some of the modeling that was used, their results, and how reliable [they were] because they were linked models. Input from one model would be linked to another, so as a result any errors would be propagated.

Many models in EA are either not validated or only partially validated and each of these models have assumptions built into them because of their partial validation status. “DFO expressed its concern about the uncertainty of the predictive models. It stated that the models are based on limited data and a number of assumptions and cannot predict with certainty the success of fish habitat compensation” (Report of Joint Panel, 2011: 65). Scientific assumptions are made throughout all these projects because the reports show that the *same* models get used from project-based EIA to project-based EIA. Practitioner (4) commented on the gaps in knowledge evident in the modelling process:

The survey effort and the interpretation of the resulting impact models (which were used to draw conclusions around specific impacts of the project regarding species at risk) were really reliant on the reliability of the survey effort, and the detectability of a species. This uncertainty scales up through the process. Therefore, the foundational and empirical work that is collected on the ground to inform models (on which we base decisions) is of great concern, because the details of the survey design and the survey effort are not solid.

Concerns about survey designs were mentioned by the majority of practitioners interviewed (three of five). The proponents will typically complete only one round of wildlife surveys (no replications between years), and in their opinion (statistically) the results cannot produce reasonably sized confidence intervals, and accordingly there is considerable uncertainty about the population density.

Two of five consultants and two of five practitioners believe that a large level of uncertainty in modelling also involved reclamation inputs. Uncertainty around the reclamation of habitat is demonstrated in the literature: “The effectiveness of TOTAL’s reclamation strategy for species at risk, specifically the uncertainty with how long it would take for species at risk to re-colonize the area” was a concern (Report of Joint Panel, 2011: 37). Similar concerns were voiced by Consultant (3):

Wildlife components in models have many assumptions built into them because of the knowledge gaps or data gaps. They’re using model results to estimate the impacts on species habitat and those impacts are bases

on invalidated models. So, the use of the models needs to be approved. The consultants using them need to do a better job at validating the models so that the effects on species habitat are more accurate. Basically the same assumptions are being carried through all these projects because reports show that the same models get used from EA to EA.

That the same model components and input parameters are being carried through many EA projects is an important issue in current EA practice.

Unfortunately, Alberta Environment declined to attend the Joslyn North case hearing. Four of 19 (21%) participants spoke about the absence and speculated about possible economic reasons (i.e., not being able to spare an expert for the full length panel hearing), and others speculated that Alberta Environment would like to avoid negative discussions concerning perceived insufficiencies in their measurable criteria and threshold standards. If true, the latter reason is unfortunate as provincial governing bodies usually have valuable information about species at risk and associated uncertainties (e.g., wildlife corridors and setback recommendations). The panel member had this to say about their absence: “One of the constraints we had is that that competent regulator (Alberta Environment) would not participate in the hearing. This is a pity, because they usually have valuable information that could help decisions. So that is a problem that enhanced the uncertainty because we didn’t have relevant expertise there.” The panel recommended that prior to any authorization of the project that the Alberta Sustainable Resource Development (SRD) Department, out of Alberta Environment, work with EC and TEPCA to ensure that additional mitigation, such as using off-site offsets suitable for species at risk, be developed (Report of Joint Panel, 2011: 43).

A conservation agreement was developed with EC and TEPCA stating that “those portions of the Project land that have an impact on the species at risk identified in Schedule 2 of this conservation agreement will require replacement habitat.” Originally this offset was looked at as a positive step forward as usually industry stakeholders are reluctant to have such an offset. However, a Aboriginals Representative offered a different opinion: “[TEPCA] attempted to have an offset area north of McLuland lake. The problem with that is the company could decide to develop that piece of land later. So it may be developed prior to Joslyn being reclaimed, so then it doesn’t become an offset.” A majority of participants (11 of 19; 58%) noted that because of the lack of enforceable legislation (i.e., not having a required wildlife offset area), criteria, or thresholds, the

wildlife effects are difficult to assess. It was suggested that having a required minimum offset might not only help quantify effects of oil sands developments, but also could lead to fewer cumulative impacts.

#### *4.3.3 Cumulative Effects*

A large majority of participants, 16 of 19 (84%), mentioned specific uncertainties related to the cumulative effects on wildlife in general and species at risk in particular. Their concerns were summed up by the panel member: “The cumulative effects assessment wasn’t really well done and as a result, there were some issues about what the cumulative effects would be on for some wildlife species. There is pretty much no doubt about what would happen to wildlife species within the 70 km<sup>2</sup> that would be obliterated by the mine, at least for the time of disturbance (which would be decades), [the species] wouldn’t have a place to live.” This animal displacement would be amplified by the Joslyn North mine, since due to oil sands mining the small corridor left along the River would be almost non-functional. There would not be just one mine in the way, but many, and a lack of connectivity.

Modeling was completed to make predictions for cumulative effects on wildlife, but significant uncertainty remains. Many of the effects (for example noise impacts) of large projects such as Joslyn North are going to take a long time to present themselves; therefore, it is difficult to predict the cumulative effects. Consultant (5) pointed out the potential scope of these impacts: “One of the biggest issues we face working in this industry and dealing with uncertainty is that most of these projects are evaluated on project-specific impacts, they are not dealing with the potential for cumulative impacts on communities, whether that cumulative impact is on a health level or the cumulative impact is on an ecosystem level, or it is on a cultural/spiritual level, or a community level.” As noted by 16 of 19 participants (84%), many projects go forward without properly considering cumulative effects. Where there are many projects side by side, the potential for long-range impact on communities and the environment creates a high level of uncertainty.

#### **4.4 PARTICIPANTS’ SUGGESTIONS TO IMPROVE UNCERTAINTY DISCLOSURE, CONSIDERATION AND AVOIDANCE PRACTICES**

All participants discussed many suggestions for improved practice on various topics including uncertainty communication. The most predominant suggestions are in Table 4.2, and discussion in the sub-sections that follow.

**Table 4.2:** Predominant recommendations made by participants in Joslyn North Mine case study.

<b>RECOMMENDATIONS</b>	<b>STAKEHOLDER GROUP</b>
Increasing model validation and incorporation of better baseline information for more accurate input parameters.	Consultants; Practitioners
Improved cumulative effects management through positive communication techniques like research dissemination between proponents.	Panel Member; Aboriginal Representatives
Be clear and upfront about uncertainties by bringing uncertainty information to the forefront of EIS documents.	Aboriginal Representatives; Consultants

Develop a standardized system to better manage uncertainty in the EA process – without a methodology on how to properly address uncertainty, it is mostly addressed via professional judgment.	Consultants; Regulators; Aboriginal Representatives; Practitioners; Panel Member
Projects changes (e.g., redesigns) should be explicitly communicated and handled after changes in ownership ensue.	Consultants; Regulators; Aboriginal Representatives
Challenging existing language barriers by developing an effective method to communicate scientific language to all stakeholders.	Consultant; Panel Member; Regulator; Practitioner
Defining environmental thresholds and criteria through policy development and legislative changes.	Consultants; Aboriginal Representative; Intervener; Practitioners; Regulators
Increasing baseline information and research (e.g., more field studies and increased partnerships for studies).	All Stakeholders

It is important to note that although a stakeholder group may be identified, this does not imply unanimous agreement but rather agreement of a majority.

#### *4.4.1 Better Handling of Uncertainties Through Successes and Failures*

A majority of participants (15 of 19; 79%) suggested that projects should be better communicated and handled after changes in ownership ensue. The Joslyn North case demonstrated the challenges and confusions that can result when there is change in operators. The original EIS that had been completed was essentially irrelevant because the project had changed so much in scope and size. The original DCEL EIS baseline data for wildlife populations and habitat description was used, but how the newly redesigned project would potentially impact those valued components instigated many questions that would normally have been answered in the EIS and SIR processes. This made for a very long hearing process, where an unusually large number of recommendations were made (approx. 88 in total).

Additionally, according to 16 of the 19 participants (84%), the cumulative effects assessment left much to be desired. As more and more projects are approved and implemented, special attention must be placed on cumulative effects assessments and management. The panel member emphasised this point: “You do the research, you implement it, but you get your friends to do it... that’s cumulative effects management. What you want to do is find a mechanism that will push cumulative effects management to be more likely to happen. It is hard to enforce.” A few



participants (6 of 19; 31%) made the specific suggestion that cumulative effects management should be an integrated mitigation effort by including all companies in the area. The practitioners and the panel member interviewed reflected that proponents should be completing comprehensive studies on species at risk to mitigate uncertainties, and to disseminate knowledge to other companies to minimize cumulative effects. The proponent should apply known research to a project and then influence other companies to apply their findings to their projects to better protect species at risk.

The data reveal that in most EA, (including the Joslyn North case), data collection happens behind the scenes, rather than openly or publicly. A strong communication presence and openness about data collection at the front of the assessment would go a long way to resolving trust concerns and misconceptions at the back end. While a company may speak about being open and transparent, in the view of Aboriginal Representative (2) there has been little improvement in the way of including communities in the planning states of an EA: “They may have corporate statements about minimizing effects or continuous improvement, and some of those corporate goals and social responsible goals are very important, but they are also accountable to the shareholders as well. In the end, they are looking after the interest of the company.” Having such corporate goals and responsibility statements in place is not useful if they are not implemented and the sheer pace and scale of resource development can hinder community involvement. More opportunity for different communities to participate in the processes is a suggestion made by 12 of 19 participants (63%).

#### *4.4.2 Overcoming Communication Challenges*

Many different stakeholders and groups are working in the oil sands industry and there is no standard process for understanding and communicating uncertainty. Fourteen of 19 (74%) participants spoke about uncertainties arising from the use of professional judgment to those arising from inadequate training. Different groups weight variables differently. For example, the federal actors emphasize wildlife concerns because these are important to them. Consulting firms may base decisions and actions on professional judgment and field experiences. Other stakeholders are working from their industry backgrounds, specialization, area of expertise, and so on. Indeed, additional information about uncertainty may be seen as not help with lessening uncertainty, but only as to further complicate and cloud this bubbling brew of opinions, values, and potential outcomes.

Guidelines for the use of professional judgement in lieu of sufficient scientific data are required. Certainly many of the challenges with communicating uncertainty start with interpreting the fuzzy, and sometimes contradicting, variety of professional judgments regarding potential impacts. Due to the high levels of uncertainty in EA already, it is fairly common practice to predict impacts on professional judgment alone, but professional judgment has little standards or criteria. This is exceedingly dangerous. Because of the complexity of natural systems, it is not that easy to predict impacts, yet currently there is a lot of reliance on professional judgment and the uncertainties are not communicated strongly enough are downplayed and can often even be overestimated. A more standardized process would build on shared understanding of processes, concepts, theories, and terms, rendering the process more transparent. As suggested by Regulator (1), “There is no set standard on how to deal with uncertainty in the EA process, making it hard for it to be considered. Without a proper methodology on how to properly address uncertainty it is all based on professional judgment.” Therefore, all participants agree that there should be a far more upfront and honest way to scientifically describe the assessment of the impacts and the associated uncertainties; a standard process needs to be consistently applied.

Differences in language connotation can also lead to uncertainty communication minimization. For example, the uncertainty about whooping cranes in the oil sands area was mentioned by three of five practitioners. The cranes fly over the oil sands and *might* land in tailings ponds – that ‘*might*’ of course is portraying the uncertainty. However, a ‘*might*’ often means that panel members or project proponents do not actually consider that significant impacts ‘*might*’ occur. Data showing that the prediction is a likely event would lead to greater consideration; however there is no exact figure and no estimates of the probability of a crane landing in a tailings pond. Practitioner (1) sums up the challenge: “You’ve got the optics of trying to explain to people that we are making the decisions on the best available information but we don’t know everything and people don’t like that...I think there needs to be a better way to communicate what we mean when we talk about uncertainty, and what the impacts of that uncertainty are and what procedures and programs you have in place to make sure that we are on top of the things that we are uncertain about, and that we are getting more information as we go along.” Affected interest groups negatively react to hearing about uncertainty about what ‘*might*’ happen. When uncertainty is

explained in the EA process, a corresponding management strategy to better adapt to the uncertainties should be developed.

Challenges exist both in moving information from the highest level (i.e., industrial relations corporation) down to affected interests, and in finding a way to explain highly technical information to all stakeholders. As Consultant (5) states, “If communities can’t engage in the [project-based] EIA process, how can they meaningfully understand what the project impacts are going to be and therefore make decisions based in that?” It was suggested by three of five practitioners that perhaps stakeholders can educate each other on the terminology that should be used universally in EAs, and in this way the majority of stakeholders can create a common understanding of the language. Striking a balance between maintaining the integrity of the scientific language and discussing EAs in layman’s terms, is tough.

One regulator commented that unfortunately the primary way stakeholders communicate during the EA process is not necessarily verbally, except at hearings. Currently most of the correspondence and conversations are completed via email, which is problematic because much of the subtleties and nuances of dialogue are absent in electronic methods of conversation. Electronic conversations do not always encourage collaboration, adaptive changes of information, and inclusion of all parties. One regulator suggested that it would be better to have mostly in-person meetings with the proponent so that explanations of expectations are clear and feedback is immediate.

#### *4.4.3 Building a Shared Understanding of Uncertainties*

All participants agree that there is not enough information regarding the ways in which complex ecosystems work, which makes uncertainty information regarding ecosystems difficult to manage. Accordingly, many information gaps are related to differences in perception of ecosystem complexity and uncertainties. Affected communities that live with oil sands development every day on their lands have a very different understanding than those who make those decisions on whether projects should go ahead or not. For example, Aboriginal Representative (1) reflects. “If you’re making decisions from Edmonton and you don’t know which way the Athabasca flows, that’s not good enough. The same way if you’re making those decisions from Calgary, so I think there’s disconnect in some ways.” Appropriate inclusion of all stakeholders at meetings and in-person table events may shed some light on disconnects, especially when the stakeholders have the

capacity to read and understand the EA and have a common understanding of the project with the company.

Another reason for some of the gaps and disconnects relates to reviewers being able to ask questions only inside their own jurisdiction. Regulator (1) contested that “much of the information is not always pushed into the panel’s hands and is not considered because they’re limited to the terms of references that are set out by the regulators.” During the review panel, stakeholders review the information provided by the applicant for gaps in the project, and SIRs are written. Review members do their best to get the information about the project to the panel in order to advise the panel about the problems they observe. As part of the Decision Report a reviewer is required to create recommendations based only on information presented at the hearing. This limit can hinder management of uncertainties.

#### *4.4.4 Improving Uncertainty Management in EA*

It was suggested by the majority of participants (16 of 19; 84%) that proponents need to be upfront regarding their past experiences with uncertainty information and potential outcomes of project implementation, but also look for changes that need to occur and communicate those changes. As Regulator (2) reflects, “The more transparency you have, the more accurate you are with predictions and the more realistic you are about using EISs or SIAs as tools for proper planning and mitigation. This is how we view it should be used, not always to be feared by the proponent.” Integrity and comprehensiveness should characterize the process. Intervener (2) attests that “there is a real a sense to downplay risks and present the best-case scenario and there really needs to be a broader range of best-case and worst-case scenario in high low and medium levels of developments.” A wider scope of scenarios will better prepare stakeholders for a range of outcomes and create a sense that participants are acting in good faith.

On a broader scale, it was suggested that after each project, proponents should be collectively building and understanding results so that the next project has the benefit of applying new knowledge and improve based on the previous projects by creating a database or inventory. While nobody likes to admit failures, and positive outcomes are communicated more often than negative outcomes, there must be a willingness to disclose negatives too. It was suggested by the majority of participants (16 of 19; 84%), that on the EA side, thresholds and criteria of environmental management need to be written in legislation to be enforceable. These participants

mentioned that there should be a standardized risk and uncertainty assessment process for EA that all professionals and practitioners can follow. The environmental impacts were not quantifiable for the Joslyn North case and all oil sands mine developments because of inadequate criteria or thresholds. Having and enforcing more stringent thresholds and criteria will increase the accountability of proponents completing these projects.

With regard to community input, some participants suppose that more time is needed to categorize the potential impacts from the communities' point of view using community-based criteria. If more time was given, proponents could do a better job integrating social and cultural concerns into the assessment. As mentioned by Regulator (1), "Stakeholders are suspicious about industries' ability to mitigate and the government's willingness to govern, so given what they know which is partial knowledge, they certainly wouldn't approve it [the project]. Give them full knowledge and they would demand more conditions of approval and more stringent criteria." Stakeholders cannot force the company to be accountable, or to fully disclose the facts. Establishment of strong criteria and protective thresholds may help, and should be developed and shared by researchers who are not tainted by the industry. Other recommendations include more enforceable legislation, better regional and project-specific assessments, better follow-through after hearings to ensure mitigation and monitoring, and prioritizing of uncertainty. Uncertainty must be brought to the forefront of the document rather than being "buried in the appendix," according to Consultant (1).

## **Chapter Five**

### **Discussion**

Chapter Five begins by providing a brief explanation of the Joslyn North case and its contextual dynamics. This is followed by an explanation of how those dynamics contributed to uncertainty disclosure, communication, and avoidance behaviour, and how particular theoretical perspectives can be applied to uncertainty consideration in the Joslyn North case. Lastly, the idea of a *realm of influence* is presented: internal factors of uncertainty (within EA stakeholder control to aid in uncertainty disclosure and communication) and external factors of uncertainty (what is not within EA stakeholder influence) are explored.

#### **5.1 THEORETICAL PERSPECTIVES ON UNCERTAINTY IN THE JOSLYN NORTH CASE**

Increasingly, practical limitations in the effectiveness of EA are attributed to its theoretical shortcomings; in fact, EA has been identified as being theoretically impoverished (Cashmore et al., 2008). Regardless, many of the findings in this study support the theories used to explain uncertainty analysis in EA (as introduced in Chapter Two). These theories were not developed for EA specifically, but are applied to this thesis for the purpose of understanding and analyzing its results.

##### ***5.1.1 Prospect Theory and its Relation to Uncertainty Management***

Prospect theory describes the way people choose between probable options that involve some risk, where the probabilities of outcomes are known (Kahneman & Tversky, 1979). This theory applies to EA decision-makers who try to make informed decisions by closely looking at the probabilities of their choices and the associated risks with their choices. Prospect theory applied in EA practice stresses that uncertainties should be disclosed early in the EA process so that decision-makers can make informed decisions and avoid higher risks (Tversky & Kahneman,

1992). Please refer to Chapter Two, section 2.5.1 for a more detailed description of Prospect Theory. Improved communication of uncertainties might lower risks, as high probabilities contribute to the prevalence of risk aversion (Tversky & Kahneman, 1992). With Prospect Theory in mind, an assessment of risk-taking behaviour in the AOS region can be completed. Participants were concerned that proponents may not fully assess the probability of occurrences that could be triggered by completing only minimum requirements; persistently completing ‘just’ the minimum requirements project after project (though the probability of negative outcomes is much lower at the start, collectively) causes the probability of negative outcomes/impacts to rise exponentially. Environmental assessments evaluate/predict what impacts *might* occur, and many of those predictions have never come to fruition. So instead of regulators implementing new, stricter regulations that may hinder resource recovery or hurt proponents financially, companies and the government are taking the risk that negative impacts will not occur because they have always been assumed not to have occurred (rarely verified). However, the more risk-seeking behaviour proponents demonstrate, and the more projects that get approved, the higher the probability of a negative outcome event. This in fact is how many cumulative impacts occur, with proponents ‘passing the buck’ (i.e., risk and responsibility for that risk) from project assessment to project assessment, never knowing for certain the total impacts accruing over time and space (Noble and Gunn, 2012).

During the the valuation stage of Prospect Theory, a decision-maker assesses the value of each prospect presented and then makes a choice (Tversky & Kahneman, 1992). This stage occurred in the Joslyn North case when the choice between either implementing a recommended setback distance for wildlife or increasing resource recovery was presented. Although resource recovery was the option chosen by the proponents, there was a growing awareness among them that the uncertainty inherent in undefined thresholds and related criteria may have important implications for risk management in the AOS region. The economically based choice of maximizing resource recovery was selected because there was no regulating body present during hearings (Alberta Environment) to deny this request. For example, in the Joslyn North hearing there were many uncertainties communicated with regard to the lack of classification and characterization of critical habitat for species at risk, other wildlife, and appropriate setback wildlife distances, and these concerns were raised by multiple stakeholders. Stakeholders

speculated that an effective federal definition of critical habitat and appropriate setback criteria were needed to possibly avoid negative outcomes or cumulative effects of these uncertainties (e.g., accumulation of the lack of setback or corridors). The evidence in this case clearly supports the behaviour explained through Prospect Theory. As previously stated, high probabilities of events contribute to the prevalence of risk-aversion behaviour; however, in the Joslyn case the risky behaviour was chosen (i.e., the reduced setback distance in order to maximize resource extraction). Although this may seem risky to some stakeholders (i.e., there is perhaps a greater risk of cumulative impacts of mining activities) for the proponent, there is no perceived immediate loss associated with the riskier option or need for risk aversion behaviour (i.e., increasing setback distance). There could be a loss in the future, but that is unknown, so instead the proponent chose to pursue the immediate capital gain that the riskier choice allowed.

### 5.2.2 *The Certainty Trough*

The certainty trough (Duncan, 2013) suggests that while those directly involved in knowledge production in the EA process (e.g., consultants), perceive a *high* level of uncertainty about the knowledge produced, those external to the source of knowledge production (e.g., Aboriginals, general public, ENGOs) perceive *the highest levels* of uncertainty. The certainty trough is in the middle: those who *use* or manage knowledge (e.g., proponents, regulators) who choose to perceive high levels of *certainty*.

The research from the Joslyn North case illustrates that reasons for the lack of upfront communication about uncertainty may be that since uncertainty is already clear (i.e., disclosed) to the knowledge producers (e.g., consultants) they do not feel the need to change communication techniques to a manner others will understand; or the users perceive that it is communicated in a way that *all* understand simply because they do. Consultants and proponents have a financial interest in project approvals and/or the status quo, which could be why they are satisfied with uncertainty communication. Knowledge producers (e.g., consultants) are aware of contingencies in their predictions and complexities in their potential outcomes (Leung et al., 2016), whereas those external to the production (e.g., general public) have to rely on others to communicate uncertainties to them. A clear disconnect in this area of communication is evident in the Joslyn North case. The stakeholders who can be identified as those external to the source of knowledge production (e.g., Aboriginals, ENGOs, and other interest groups), perceived the uncertainty communication to be



less than sufficient. Similar results are reported in Leung et al. (2016) who reported no difference in role between the knowledge producers (e.g., consultants) and those who manage or use the knowledge produced (e.g., proponents, regulators), which is also true for this research, demonstrating that there was no clear trough from these interviews. However, those outside the knowledge production (e.g., NGOs, Aboriginals etc.) did *perceive* the most amount of uncertainty in the Joslyn North case. There are many different types of consultants engaged in any single EA process – from those who collect and model data about potential impacts to those who organize and report on the results in the impact statement (Leung et al., 2016; see also Duncan, 2008). These results demonstrate that many of those consultants, who are considered to be external to the knowledge production (i.e., third party reviewers of EIS), felt that communication of uncertainty information was inadequate by those producing the knowledge (i.e., those doing impact modeling). Overall, this research demonstrates how roles in EA practice cannot be discretely divided and that a standardized method for uncertainty communication is needed.

### 5.2.3 *The Precautionary Principle*

Jalava et al. (2013: 280) define the precautionary principle as “environmental protection based on precaution, even where there is no clear evidence of harm or risk from an activity.” In other words, lack of evidence should not be used as a reason to postpone steps that might help prevent environmental damage (Snell & Cowell, 2006). The ‘precautionary principle’ specifically deals with situations where uncertainty prevails. It has been introduced in EA as a means of dealing with uncertainty in decision-making (Harremoës, 2003; Jalava et al., 2013; Walker et al., 2003). This principle does not provide clear guidance for practice and is therefore criticized for being administratively inconvenient (Jalava et al., 2013). In the Joslyn North case, the panel member argued for the use of the precautionary principle, as both CEAA and CEAA 2012 require a precautionary approach when considering environmental effects. The panel member mentioned that if the uncertainty is vitally important (i.e., human health related) it is treated in a precautionary manner, and if it is deemed less important, it is ignored. Other stakeholders agreed with this approach as a current method of management. The panel and the proponent were content with minor risks and uncertainties that are always partially unavoidable when trying to predict future outcomes.

Stakeholders suggested that common or reoccurring uncertainties and risks that can be deemed less detrimental or critical should be outlined in every EIS, and every EIS should be specific to the region or area as the regular/more obvious uncertainties are generally spoken about already in EA processes. Moreover, documentation of reoccurring areas of uncertainty (high or low) should be made and can then be connected to common critical uncertainties for the area. Gustavson (2003) also argues this point: the environmental assessment process needs to define what is meant by ‘high’ and ‘low’ levels of uncertainty. Currently, if the uncertainty is somewhere in between high and low levels of importance, then the panel follows the principle in this case and asks questions related to adaptive management.

Since guidelines for practice are lacking, the precautionary principle should be considered as more than of a state of mind, pushing decision-makers to be more sensitive to uncertainties related to development (Renn & Schweizer, 2009). Gustavson (2003) argues that true application of the precautionary principles has suffered due to the difficulty of putting it into practice, so there is a real danger of the principle becoming more rhetoric than reality. This is true in the Joslyn North case as many participants showed concern with the scanty information available to validate habitat models, thereby placing a high level of uncertainty on the models. In oil sands development there is considerable pressure to reclaim habitats, but due to inadequate information there is a high level of uncertainty about how well stakeholders can carry out reclamation. This is consistent with findings by Gosselin et al. (2010) who demonstrate uncertainties in groundwater, GHGs, reclamation, and end pit lake models.

Nevertheless, the Joslyn North data revealed that the proponent probably could have taken more of a precautionary approach in some instances than they actually did, the panel did give consideration to the uncertainties in the spirit of the precautionary principle. For example, a larger buffer on the Ells River corridor (as recommended by the panel), would have been a good precautionary step. If implemented voluntarily by the proponent, no uncertainty discussion of the functionality of a proposed buffer would have been needed: it would exist, just as a precaution. Total E&P Canada could have avoided that dialogue by voluntarily taking the panel’s recommendation for a larger setback and buffer, rather than taking the more economical approach of maximizing resource recovery. The scarcity of enforceable recommendations and the abundance of impractical dialogue throughout the Joslyn North project necessitated the development of

systematic divisions of levels and types of uncertainties: the goal, of course, is more tangible management of uncertainties in like projects.

### 5.3 LOOKING INTO THE REALM OF INFLUENCE: INTERNAL VS. EXTERNAL

Beyond shedding light on theoretical perspectives that can be applied to the uncertainties of the Joslyn North case, the data exposes a gap in uncertainty management in Canadian EA. A need for clearer scaffolding of uncertainty management in the Canadian EA process is evident, in particular, for large developments like those in the energy sector. For the purposes of this study, uncertainties have been divided into two large groups: *internal* and *external* sources. An *internal source* of uncertainty can be defined as an uncertainty that originates from within the Joslyn North case study (i.e., professional judgment, complacency, project redesign confusion, and so on). *Internal sources* are within the realm of influence of the involved stakeholders within a particular project. An *external source* emerges from outside a particular project (i.e., regulation, legislation, natural complexity of ecosystems, and so on), but can influence project-level EIA and the regulatory process (i.e., hearings, SIRs, etc.). This idea of an external source will be different depending on the project, some sources may be addressable depending on particular dynamics of a project and the individuals, organizations and governing bodies involved. The external sources will need to be critically discussed with all stakeholders involved in the project-EIA. The table (5.1) presents internal and external sources of uncertainty in the Joslyn North case.

**Table 5.1:** Internal and external sources of uncertainties divided based on data collected from the participants of the Joslyn North Case Study.

Topic that was not discussed	
Uncertainties insignificant to results of the EA decision	
Uncertainties that were discussed as present, but did not affect the decision severely	
Significant uncertainty that should have effects results and were discussed in the interviews	

Participant Code*	1	2	3	4	5	6
<b>INTERNAL –Inside Realm of Influence</b>						
Terms of Reference						
Understanding of the Project Details						
Language and Dissemination of the Assessment						
Use of Professional Judgment in Lieu of Sufficient Data						
Uncertainties in Predictions						
Uncertainties Regarding Species at Risk						
Uncertainties in Mitigation and Monitoring						
Reclamation						
Deficiency of Aboriginal Concerns in the Assessment						
Uncertainty Minimization						
Uncertainties Regarding Tailings Management						
Uncertainties Regarding Aboriginal/Treaty Rights						
Uncertainties about Noise Effects						
Uncertainties Regarding Absence of Measureable Thresholds and Criteria						
Uncertainties Regarding Assessment Scope (not project-specific enough)						
Uncertainties Regarding the Alberta Approval System						
Uncertainties Regarding Airshed Management (including odours)						
<b>EXTERNAL – Outside Realm of Influence</b>						
Relationship Dynamics with Governing Bodies and Industry						
Lack of Proper Historical Baseline Data						
Uncertainties Regarding Cumulative Effects Assessment						
Major Project Changes						
Varying Lenses of Understanding						
Uncertainties Regarding Policy Limitations						
Uncertainties Regarding Regulatory Requirements (weak)						
Uncertainty of Future Impacts (e.g., climate change)						

\*Note: (1) Aboriginal Representatives; (2) Practitioners; (3) Panel Members; (4) Consultants; (5) Regulator; (6) Intervener

Table 5.1 presents all commonly mentioned sources of uncertainties in EA and within the Joslyn North case as described by three or more participant groups. The next subsections (5.3.1 – 5.3.5)

present the most frequently mentioned uncertainties in the study results and assess whether or not these uncertainties are within the realm of EA stakeholder influence.

### 5.3.1 Uncertainty in Predictions

As shown in Chapter Four, uncertainties in impact prediction and accuracy were a major concern for a majority of stakeholders interviewed. It is clear that a lot of uncertainties in predictions stem from uncertainties with the predictive models used in the oil sands development. The results from this Joslyn North case study have been consistent with many others in finding that much of the uncertainty within EA lies within the predictions, and more specifically the models used to develop predictions (*Environmental Decisions in the Face of Uncertainty*, 2013; Gosselin et al., 2010; Maier et al., 2008; Sigel et al., 2010; Wardekker et al., 2008).

Unfortunately, most of the models used in EA are not validated, and the central role of prediction in EA makes bias (i.e., personal goals, values, bias, and the use of professional judgment in lieu of data) unavoidable (Wilkins, 2003). The proponent and their consultants predictions to complete an EA based on either irrelevant or incomplete datasets as much information cannot be found, or in situations where there is an over-abundance of data leading them to bias (i.e., using professional judgment in lieu of data) (Wilkins, 2003). Bias and assumptions within the models (not validated) being utilized (e.g., models used for reclamation estimates) were frequently mentioned as a concern by many practitioners and consultants in the Joslyn North case.

Knowledge of the environment will never be completely sufficient to accurately predict exact impacts (Wilkins, 2003), but input into models are at least in the realm of EA stakeholder influence. Uncertainties in predictions could be better managed if more attention was focused in a few areas: (1) by applying more research and effort into model validation; (2) by increasing monitoring and research in order to have more realistic model inputs through consistently updating baseline data; and (3) create stricter thresholds and measurable criteria for developments. Project-based EIA development should not favour one point of view over another; however, the appearance of subjectivity is difficult to avoid if the proponent is conducting the assessment (Wilkins, 2003).

Consultants and proponents might not always be the best judges of shortcomings in their models (Lahsen, 2005). Usually, proponents have multiple interactions (conferring and meeting) with consultants who utilize predictive models in EISs. If during these interactions all uncertainties are disclosed, project proponents (who are close to knowledge management) can tweak outcomes

to their advantage and take control of analysis in the decision-making process, prior to uncertainties being presented to the general public. For example Kirsch (2014) demonstrates that environmental management programs within mining companies may involve systematic manipulation of scientific processes, from data collection and analysis to the presentation of the results. Based on the stakeholder concerns presented in Chapter Four, the uncertainties raised about models in the Joslyn North case might originate in the highly subjective inputs of proponents and consultants.

Several participants complained that foundational assumptions inputted into the models were not negotiated with major stakeholder groups (e.g., ENGOs, Aboriginals) who have culturally significant values (i.e., land user values). If these values were addressed and assumptions were shared with all stakeholders, then the proponent could be held accountable, as all stakeholders would understand the information (Duncan, 2013). The social license of the proponent would be strengthened through their respect for Aboriginal and Métis peoples' values in their decision-making practices, and through their open communication about uncertainty. Communicating with land users most familiar with areas being proposed for development would provide proponents with fresh, highly beneficial information. However, lack of communication and consideration of different values is common across mining developments. For example, a mining case study by Kirsch (2014) demonstrated that various responses by company management in an attempt to ensure that environmental values (e.g., environmental or social components/values important to Indigenous people) were still on the landscape after production of copper and gold were mostly communicated in engineering terms rather than using Indigenous, intervener, or community values.

### *5.3.2 Uncertainties with EA Regulatory Requirements and Information Dissemination*

The most prevalent need revealed through the results is that uncertainty and risk communication must become more open and truthful. This research confirms that communities, Aboriginals, and NGOs often do not have the capacity to fully review a project, so the associated risks are not fully understood. Since industry and government are perceived as being fearful of uncertainties and risks being communicated, risks are often presented as limited. For many years, the oil sands industry and provincial and federal governments claimed that there were no negative effects of the industry, but the poor detection of these effects was in fact due to inadequate monitoring efforts (Mantyka-Pringle et al., 2015; see also Kelly et al., 2009 & Schindler, 2013).

As the results of the Joslyn North case demonstrate, the proponent is perceived to be fearful of divulging uncertainties in case divulging could lead to project rejection. Inadequate communication of uncertainties is a preferred option.

By disregarding recommendations proposed by the panel (e.g., a certain wildlife setback distance), the proponent and provincial regulatory bodies in the Joslyn North case created even more uncertainty. A proponent who is allowed to ignore recommendations is in turn enabled to develop scoring systems that may facilitate current adverse practices (e.g., minimal monitoring, failure to use precaution, and so on). All participants believe that being upfront about the uncertainties from the beginning is a more transparent way to conduct assessments - this belief is evident in the work of those who explore trade-offs (e.g. setback distances being traded off for increased resource recovery) in decision-making (Retief et al., 2013). In the long run, people perceive unexpected negative outcomes as much more adverse than expected negative outcomes (Retief et al., 2013). This perception also can be applied to uncertainties, for example, those uncertainties that are hidden are perceived more negatively than those that are openly disclosed.

Internal communication between the governing bodies and major players (i.e., consultants and proponents) was effective in the Joslyn North case. External communication, however, was poorly executed (i.e., consultants between general public). Though most documents for project-based EIAs are available for public viewing, participants did mention the notion that information may be intentionally hidden from Aboriginals and other stakeholders. This potential information restriction could give proponents an advantage over their reviews (see also Kirsch, 2014). Moreover, plain-language environmental assessment information is not available in all jurisdictions (see also Hunsberger et al., 2005), and the stakeholders who are not closely involved with the intimate proceedings (e.g., general public vs. regulators) often do not have the technical knowledge or background to understand what is being said even when information is put into layman's terms. Indeed, it was suggested that some of the parties who were carrying out the reading and explaining of the technical reviews did not quite understand the policies themselves, thereby creating difficulties in the dissemination of the uncertainty information in the EIS. Untrained or incompetent/unethical EA stakeholders should be considered a major source of uncertainty, especially on the social side of the oil sands EA industry (Westman, 2013).

This question of appropriate presentation and communication through the decision-making process is argued by Tennøy et al. (2006) as being just as important as prediction accuracy EA. Ineffective information dissemination creates mistrust. Mistrust is perpetuated when stakeholders receive shallow information about potential impacts and are unable to have meaningful discussions about mitigation. This research supports Tennøy et al.'s (2006) premise that decisions to support a project are typically based on the manner in which the information is put forward (i.e., how clear it is, the existence and nature of uncertainties, etc.). If stakeholders frequently need to search for information, have differences in trying to comprehend information, or are sensing that information is being hidden, projects will likely be delayed.

Wardekker et al. (2008) showed that policy makers preferred to have uncertainty information presented in the appendices of an assessment. This differs from the results of this study, where most Joslyn North participants wanted the uncertainties laid out in the front of the document. Some of the officials who represented the Aboriginal organization or the general public who, not being familiar with specialized technical documents, would not know to look for uncertainty information in the appendices. Relevant information must be explicitly disclosed to relevant audiences (Wardekker et al., 2008), and so even the physical location of uncertainties within the document must be carefully considered.

Another internal source of uncertainty relates to research. For example, without strong criteria for the establishment of protective thresholds related to species at risk, many participants wondered if the required research (e.g., scientific research in ecology) was completed at all, or was completed in a way to minimize complications for the proponent (e.g., hiding effects so the EA timeline can continue). Having practitioners and the relevant governments engage in a meaningful dialogue about appropriate setback distances and definitions of critical habitat would be highly beneficial.

### *5.3.3 Value and Judgment Based Uncertainty in EA*

Uncertainty created by the use of professional judgement in EA was a common theme mentioned in the Joslyn North case. The reality of subjective decision-making in EA means that the values of the stakeholders involved play a significant role in determining outcomes (Wilkins, 2003), and the Joslyn North case was no different. Geneletti et al. (2003) and Morgan et al. (2012)



both state some of the main uncertainties found in impact assessments are those related to the values, judgements, worldviews, and preferences expressed during the assessment, and that not overcoming these entrenched professional and bureaucratic perspectives hinders the development of a quality EIS.

The Joslyn North research supports Duncan's (2013) premise that uncertainty analysis could benefit from a shift towards collaborative knowledge-making (see also Jalava et al., 2013). For example, the results show that TEPCA could have communicated more effectively with the land users who are most familiar with the areas of interest of TEPCA. Those land users would be able to provide them on-the-ground information about species at risk and critical habitat areas.

One suggestion made by participants for better management of uncertainty communication in EA is for the proponent to employ an independent body, as recommended by Duncan (2103). With an independent party heading the assessment, personal interests would not be at stake and all values would be taken into consideration. Proponents would neither influence nor control the environmental information and analysis, nor ignore the uncertainties along the way (Bidwell et al., 1987; Duncan, 2008; Duncan, 2013; Morgan et al., 2012; Wood, 2008).

It is important to test how sensitive model results are with respect to variations in the values that are input in them (Geneletti et al., 2003; Wardekker et al., 2008). Maier et al. (2008) say that the uncertainty of human input (i.e., bias of values, mistakes in data input and so on) is a part of EA that has not received enough attention, and findings by Wilkins (2003) suggest that subjectivity should be a touchstone to promote more meaningful conversations, which can be valuable in such a multi-stakeholder process like EA. Regardless, judgement and personal values do have an effect on how information is analyzed, presented, and discussed in an EA. This research on the Joslyn North mine supports Wilkins' (2003) premise that subjectivity can promote sustainable development by exposing the inherent value loaded nature of EA (e.g., using subjectivity as an advantage, for example, promoting the use of values and knowledge of Aboriginals) and promoting public participation. However, it remains a challenge to promote a discussion on subjectivity when many of the EAs are written in a format readily comprehensible only by those who are embedded in the science/policy interface.

#### *5.3.4 Uncertainty with Policy Development*

The EA process was developed as an enforcing mechanism and has been widely adopted around the world (see Morgan, 2012; O'Riordan & Sewell, 1981; Wood, 2003), yet the environmental policies it serves tend to be overlooked (Caldwell, 1988; Morgan, 2012). As demonstrated in the results, policy limitations (i.e., science - policy interface are often ignored, lack of appropriate regulations) are another source of uncertainty embedded in the regulatory process.

Increasingly, the relaying of information to those who make policy decisions on, for example, potential environmental impacts is portrayed as a means to an end (Cashmore et al., 2007). While awareness is growing regarding the importance of evaluating uncertainty when it comes to developing policy in the discipline of environmental science (Maxim & van der Sluijs, 2011), panel recommendations for policy updates are still often overlooked (Morgan et al., 2012). This is true of the Joslyn case in that the panel made recommendations for the development of a federal definition of critical habitat (that way promoting a more stringent criteria to follow), and then recommended a significant setback from the Ells River Valley habitat for the SARA bird guilds, yet the provincial government decided against implementing these recommendations.

The Cumulative Effects Management Association (CEMA) is an organization formed to develop policies and frameworks to address uncertainties over time in the AOS. The Cumulative Effects Management Association, however is not being funded to the level it would require in order to carry out research to back the policies needed to meet actual approval conditions. Most of the time, policy changes are recommended in-situ on a need-to-need basis, rather than in a preventative manner. Many proponents are confident that new projects will not repeat mistakes of their forerunners, yet this confidence is often the starting point of hubris and leads to neglect and possible negative impacts (Kirsch, 2014). Part of Kirsch's (2014) research demonstrates that information has to be disseminated not only to the Aboriginals, affected interests, and other stakeholders, but also from proponent to proponent so that effective cumulative effects management can occur through proponent learning experiences and policy development be instigated.

Participants suggested that the dearth of policy development is based on the uneasy relationship between government and proponents. Participants reflect that industry is fearful that new policies will negatively affect their operations and the way that they conduct business. Government planning and the will to implement appropriate environmental standards are not

muscular enough to negotiate with multi-national companies that prioritize profit, development, and jobs over environmental issues. As stated in Chapter Four, the majority of participants noted that given the right tools, communication could be improved, but were unconvinced improvement will ever be possible with the current regulatory system. Implementation of a living policy framework will not occur without a strengthened regulatory system.

#### *5.3.5 Deficient Assessment Integrating Aboriginal Concerns*

Environmental Assessment has commonly been criticized for excluding the knowledge of the local public in key steps of the process, preferring instead expert consultant or practitioner knowledge (Galbraith et al., 2007). Yet, uncertainties around impacts such as noise, odour, road construction, truck fleets and so on, intimately impact the communities living in close proximity to the mines. Consultants for Aboriginal organizations interviewed for this research would agree with that criticism. In oil sands development in particular, uncertainty regarding noise, odour, environmental impacts, road building, and so on impact all the local communities in a comprehensive manner. History bears this comprehensive involvement out as Justus and Simonetta (1982: 249) concluded that there are “serious disruptions on the social fabric” of Aboriginal communities in the Athabasca oil sands (Geisler et al., 1982). Uncertainties such as noise and odour may not be politically labelled as high level uncertainties (like those involving critical or immediate human health concerns), but Aboriginals and Indigenous communities may continue to live on their ancestral lands and practice their treaty and Aboriginal rights through these unsettling conditions, which can ultimately disrupt their sense of place (see also Jackson, 2011).

The current perception is that operators *say* that they will consider traditional knowledge of Aboriginal members (TK) in their plan, but this has yet to be demonstrated. Consultation is still often one-sided, and the expectation persists that financial benefits will outweigh the social and/or environmental consequences (Mantyka-Pringle et al., 2015). For example, in the Joslyn North case, resource recovery took precedence over wildlife setback distances and connectivity concerns.

Current EAs are largely drafted and developed according to western science and do not engage sufficiently with the community to identify local issues (see also Geisler et al., 1982; Mantyka-Pringle et al., 2015; O’Faircheallaigh, 2010; Suopajarvi, 2013; Westman, 2013). Regulators, interveners, practitioners, and Aboriginal representatives in the Joslyn North data noted

that at times uncertainty must be intentionally hidden because the government just keeps approving projects regardless of what the Aboriginals, Métis or other stakeholders have to say (see also Westman 2013; O'Faircheallaigh 2010). However, increasingly, Aboriginal communities are negotiating private agreements or impact benefit agreements (IBAs) with mining project proponents as a means of managing impacts and ensuring that local communities secure some benefits from the developments, particularly in regions without settled comprehensive claims (Cameron & Levitan, 2014; Galbraith et al., 2007). Benefits of IBAs typically include provisions of skills and training, employment quotas, financial compensations, environmental mitigation-related measures and sometimes cultural-related benefits (Cameron & Levitan, 2014). Normally, industry proponents and signatories of IBAs insist on confidentiality of the agreements, as such, much of the documentation is not available to the public (Cameron & Levitan, 2014). Though these reports are often viewed as an improvement to past practices, Cameron & Levitan (2014:48) report that there are still concerns among Indigenous leaders that IBAs are “merely a quick fix with a primary function to secure projects with significant long-term effects.”

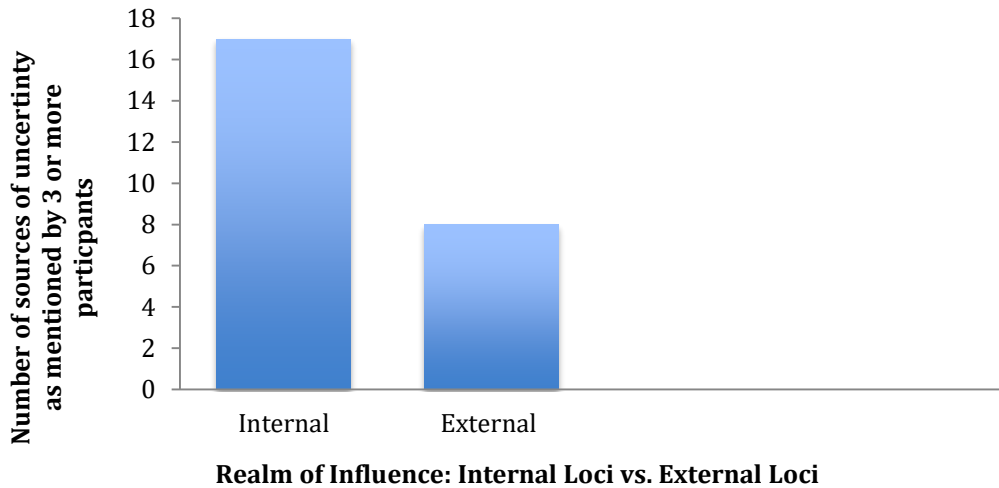
Uncertainty results when narrowly constructed cultural views conceived by consultants, proponents, and government officials (who find it difficult and time consuming to consider Indigenous Peoples cultural traditions: traditions that are more spiritual than technical in nature) do not appropriately write the futures of Indigenous Peoples in the tar sands region (Westman, 2013). In other words, the futures “produced” in these reports have tangible effects in the world not accurately envisioned by those making decisions in cities outside the affected communities. This explains the difficulty of Aboriginal and Métis people communities and bureaucrats sitting down together to share knowledge (Nadasdy, 2004) since a wide difference in philosophies and future expectations exists. A picture of a future desirable to both parties is out of focus (i.e., differences in ending goals) (Westman, 2013).

#### 5.4 DRAWING ATTENTION TO UNCERTAINTIES WITHIN THE REALM OF INFLUENCE

A *realm of influence* is a term that describes an area where major EA stakeholders (i.e., proponent, practitioners, Aboriginals and Indigenous communities, consultants etc.) can identify common and *addressable* uncertainties in sections of an EA process or within an EIS. Stakeholders can gain control over those uncertainties, given the right tools. In the Joslyn North EIS, many

particular topical areas or '*loci*' of sources and/or types of uncertainties were found (e.g., within policy development, federal standards, criteria, and current information dissemination techniques, and so on). It can be difficult to decide which uncertainties are the most important for the environmental and social conditions at hand (Cashmore, 2004; Lawrence, 2013; Morrison-Saunders & Bailey, 2003; Noble & Storey, 2005; Noble, 2000; O'Faircheallaigh, 2010). The Joslyn case showed that concentrating on a *locus of uncertainty* provides a realistic platform in which to apply policy as policy makers can better narrow in on empirical and applicable examples of common locations or positions of uncertainty.

There has been much research into the kinds of uncertainty which help assess the reliability and adequacy of the available information enabling better actions in uncertain conditions (Walker et al. 2003; Harremoës 2003; Gabbert et al., 2010; Heidmann & Milde, 2013; Sigel et al., 2010). For example, Wardekker et al. (2008) indicate that policy advisors emphasize a particular interest in the various types and behind-the-scenes causes of uncertainties, such as modeling-uncertainty and scenario-uncertainty and these causes and types of uncertainties are important for aiding policy responses. However, many of those policy responses are ignored by the proponent, meaning there is a need for government willingness to enforce policy in particular common areas or *loci of uncertainty* based on real life examples for appropriate application. The *locus of uncertainty* can be assessed first by those intimately involved with the regulatory process (i.e., regulators, proponents, practitioners, etc.) in determining whether the uncertainty is *within their realm of influence* of stakeholder EA (i.e., development of measureable criteria and standards, updating of policy based on dialogue from hearings and so on). As seen from Table 5.1 there are many *loci* of uncertainty that can be assessed in current EA derived from this research; in fact 17 of 25 *loci* of uncertainty are within the stakeholders' realm of influence (see Figure 5.2).



**Figure 5.2:** Distinction of uncertainty *loci*, which are internal and external to the realm of EA stakeholder influence as developed from the Joslyn North Case.

Considering a *locus of uncertainty* as a guide to better handle uncertainty information promotes a healthy degree of transparency in EA, as the *locus* will provide a starting point from which to target specific locations where uncertainty communication is notoriously weak. Guidance is especially needed in oil sands development, which historically has not always been transparent (Gosselin et al., 2010). The results of this study show that all participants agree upon the benefit of disclosing what is unknown (i.e., talking more candidly about the lack of uncertainty information), and greater honesty and transparency.

## **Chapter Six**

### **Conclusions**

After 19 interviews, which were validated by using other sources of information including government, grey, and peer-reviewed literature, enough data was collected to interpret the approach to uncertainty disclosure, consideration, and avoidance behaviour of the case. The participants' responses delivered information not only on the Joslyn North case, but also the Canadian EA process in general, including the dynamics of the decision-making process for project approval. Although the results are case specific, and likely of most interest to others participating in EA in the Alberta oil sands region and similar northern resource-rich regions, the results also offer a foundation for recommendations to improve uncertainty disclosure and communication practices in Canadian EA.

#### **6.1 CONCLUSIONS REGARDING THE RESEARCH OBJECTIVES**

The first research objective was to document uncertainty disclosure, consideration and avoidance behaviour practices within the context of a single project-based EA. The Joslyn North case involved a complex and rich set of issues including many fundamental uncertainties such as the potential range of impacts with regard to wildlife and species at risk, changes in mine operators, and cumulative effects uncertainties. The research illuminated concerns about uncertainty communication practices in projects like the Joslyn North case, but also more generally in the regulatory process in EA and its stages. Uncertainty practices were documented and assessed for disclosure, consideration, and avoidance behaviour:

- (i) First, uncertainty disclosure practices were examined: after the EIS was released a concerted effort was made by the panel to understand the nature of the project and its potential impacts. The EIS that was released however, was from a different proponent, meaning that the SIRs and the hearing discourse communication were about the newly

redesigned project. At the conclusion of the Joslyn North case hearing, the panel made 88 recommendations to the proponent. This high number is likely reflective of the general lack of understanding about the revised project on the part of Aboriginals, affected interest, other stakeholders and the panel, as it was different from the original EIS. Uncertainty disclosure occurred among the panel, proponent, and regulators, who also determined the most important uncertainties (e.g., human health uncertainties). Participants felt as though most uncertainties were in fact disclosed, but perhaps were not properly considered to their full extent. Uncertainty concerns regarding wetland reclamation objectives, species at risk setback distances, cumulative effects impacts, and general confusion of project goals were all disclosed, but perhaps not appropriately considered.

- (ii) Second, uncertainty consideration practices were examined: results show that uncertainty is considered in the EA process and within the EIS, but not to the expectations of stakeholders such as practitioners, Aboriginal representatives, interveners, and some consultants. For example, the setback distances for species at risk were considered during the panel hearing, and although some were implemented, the implementations did not adhere to the panel's recommended distances. Following the recommendations as set out would have reduced resource recovery. This was an example of an uncertainty that was considered, but was traded off for increased resource recovery. The most integral concern about uncertainty consideration practices was found within the EIS: data collection and analysis typically occurs privately (i.e., not public knowledge) without balanced affected interests and other stakeholder input. Examples of this absence of stakeholder input were discussed in detail in Chapter Four, including (1) lack of Aboriginal involvement in the review (i.e., not having money to properly hire someone to review the project-based EIA, not having the time to adequately engage with the documents etc.). This lack of capacity can be due to financial limitations, or the result of many stakeholders (especially Aboriginal communities and the general public) not having an adequate opportunity, time, or platform from which to communicate concerns; and (2) the lack of participation from the provincial government during the federal hearing. Their expertise would have been indispensable with regard to wildlife concerns (i.e., the appropriate setbacks and corridors). Having



appropriate input from key stakeholders (i.e., practitioners and Aboriginals) from the beginning of the assessment process (i.e., the beginning of data collection for the EIS) through the regulatory process to the end (including the hearing) would go a long way to resolving trust and communication concerns. Early input might avoid EA participant frustration and disgruntlement at the end of the process, when input can no longer be considered (after project approval).

- (iii) Third, uncertainty avoidance practices were examined: even though many of the uncertainties were disclosed, participants perceived some as being avoided. For example, assessing uncertainty about how the cumulative noise effects of the Joslyn North project would affect the adjacent community of Fort McKay was not discussed to the extent that some stakeholders (i.e., especially Aboriginal communities) would have preferred. As well, it was perceived by participants that the proponent had reservations about discussing uncertainty information, fearing that the projects would not be approved if the extent of the uncertainty were discussed with all affected interests. Affected interests are perceived to view uncertainty communication on a worst-case scenario basis only; therefore, in the current system if an uncertainty is considered important, but not overly important, proponents avoid it.

The second objective was to investigate how contextual factors for project development (environmental, social, political, administrative) may or may not contribute to uncertainty disclosure, consideration, and avoidance practices. For the Joslyn North case, the second objective was addressed when the change in mine operators altered the dynamics of the uncertainty discussion. Results revealed stakeholder (i.e., consultants, practitioners and regulators) and confusion and uncertainty regarding the philosophy of TEPCA in comparison to DCEL. The change in project proponents contributed to the uncertainty around a few different contextual factors. First, recommendations related to setbacks of a certain distance for wildlife and species at risk were made, but were not implemented to the standards many stakeholders wanted. The federal hearing needed the original regulatory bodies' guidance when making these decisions, but that relationship was void during the hearing as the provincial regulating body (Alberta Environment)

did not attend. Second, the models used for reclamation predictions and habitat predictions were not validated, creating uncertainty and distrust in the presented data.

The final objective was to develop recommendations about how uncertainty can be more readily acknowledged, considered, and communicated in EA practice and decision-making. Key recommendations made by the participants included increased model validation, more complete baseline data, increasing effective cumulative effects management, bringing uncertainties to the forefront of documents, setting standards on how to better manage uncertainty, challenging language barriers, and better policy development to account for environmental thresholds. Additional recommendations on improving guidance through legislation and policy are presented later in this chapter.

The most significant findings of this study are stated below:

- (i) Uncertainty communication is somewhat happening in EA. The results demonstrate that uncertainty disclosure and communication took place during the regulatory process (i.e., hearings, SIRs, correspondence), as well as in the EIS among key stakeholders. It was at times downplayed though, and even avoided, when the uncertainties in question were deemed unimportant. Only uncertainties deemed important by the federal panel, regulators, and the proponent were actually discussed. Better communication between all stakeholders and Aboriginal Organizations is needed so that uncertainties that are important to groups such as Aboriginals, Métis People and the general public are discussed. Too much professional judgement is used in EA, which can inadvertently discount uncertainties that may be considered important to other stakeholders. Indeed, subjectivity in lieu of scientific data can contribute to uncertainty.
  
- (ii) When uncertainty communication is avoided by proponents and consultants due to fear of negative reaction from affected interests, many of these interests feel disconnected from the EA process. Contextual dynamics matter with regard to uncertainty communication: the fact that the relevant provincial department did not attend the hearing hampered the stakeholder's communication with regard to wildlife impacts. When stakeholder concerns

are not granted proper consideration, the resulting communication gaps affect the stakeholders' realm of influence.

- (iii) Uncertainties in the internal realm of influence can be better addressed. Certain external uncertainties, however, are unavoidable and cannot be addressed in an EA process. A list was provided in Chapter Five (Table 5.1) of particular *loci* of uncertainty, which were revealed in the results of the Joslyn Case. Some of these *loci* were within the EA stakeholder realm of influence and some were external to stakeholder influence. Improvement of EA will only be able to address some of these *loci* of uncertainty. Some that cannot be addressed are related to those confidential relationship dynamics, varying lenses of understanding (as those are value based), uncertainty of future impacts (as there will always be uncertainty in predictions), and in the oil sands specifically, lack of proper baseline data (as the landscape has changed too much to know the baseline information). The most important areas of influence (those that are addressable) should be dependent on the type of project that is being proposed and the stakeholders and Aboriginals involved.

## 6.2 RECOMMENDATIONS FOR IMPROVED PRACTICE AND FUTURE RESEARCH

With the sustained emphasis on energy development in the Canadian economy (Boutilier & Black, 2013; Gosselin et al., 2010; Isaacs, 2005; Sherrington, 2005; Westman, 2013; Woynillowicz & Severson-Baker, 2009), and a parallel interest in EA improvement (Barker & Jones, 2013; Gunn & Noble, 2009; Leung et al., 2015; Leung et al., 2016; Noble & Storey, 2005; Noble, 2000; Noble, 2010; Tennøy, 2008; Tennøy et al., 2006; Wiklund, 2011; Wilkins, 2003; Wood et al., 2000; Wood, 2008), this research makes an important and unique contribution. It illuminates the many influences on uncertainty discourse and avoidance behaviour in energy development. The recommendations provided below are intended to inform EA practitioners and academics working on provincial, national, and international scales. Specifically, insights and recommendations from the study are expected to assist decision-makers, proponents, and practitioners active in EA policy, decision-making, and environmental management.

Certainly communication can be improved, but many participants are unconvinced improvement will ever be possible within the current regulatory system. Their lack of confidence in current practice calls for a strengthened regulatory system, and the implementation of a living

policy framework, within which continuous improvements, adaptations, and updates can be made. How might the system be strengthened? Monitoring common uncertainties and improving prediction accuracy in oil sands development would encourage healthier management practices among operators of current projects, and new project proposals would incorporate these ‘best practices.’

#### *6.2.1 Guidance for Proponents to Improve Uncertainty Discourse*

Results show that proponents appear more credible if they openly disclose uncertainty in a transparent manner, rather than state there will be ‘no significant effects,’ or try to hide effects, out of fear of negative feedback. Honesty will aid them in gaining a social license, and further initiate open communication with other energy development companies; honest disclosure of successes and failures can aid in positive cumulative effects management. Open and non-confrontational conversations among stakeholders about different levels of uncertainty (less important - more important) may prompt proponents to actively explain what is meant by uncertainty. If the public, interveners, Aboriginals, Métis people and other interest groups are encouraged to *not* only think in terms of worst-case scenario when uncertainty is mentioned, proponents can then openly discuss and plan to provide better monitoring protocols and techniques in preparation for unknown outcomes.

#### *6.2.2 Guidance for Stakeholders on How to Reduce Uncertainty*

Identifying common uncertainties in current EA processes through meaningful dialogue with all participants including academics, practitioners, government, Aboriginals, decision-makers, and the proponent is essential. Specific dialogue about common *loci* of uncertainty can reduce lesser uncertainties indirectly by creating an open communication platform. Adversarial processes associated with EA can be transformed into communicative processes with liveable outcomes for most EA stakeholders and Aboriginals.

The Joslyn North research supports Duncan’s (2013) premise that uncertainty analysis could benefit from a shift towards collaborative knowledge-making (see also Jalava et al., 2013). For example, the results show that TEPCA could have communicated more effectively with the land users who are most familiar with the areas of interest of TEPCA. By communicating uncertainty information, affected interests and other stakeholders perceive that their concerns have

specific actions attributed to them, and government and industry proponents learn more about local impacts and can use that information to implement new and better operation practices. This research demonstrates that uncertainty information must be communicated to all the different groups and stakeholders from the beginning of the project (see also Geneletti et al., 2003). Research on specific habitats and legislation to create criteria to define critical habitat for species at risk requires a collaboration of stakeholders including government experts and academics. The end goal is to responsibly discern how much risk is deemed acceptable for the province of Alberta.

#### *6.2.3 Guidance for Decision-Makers on How to Address Uncertainties*

Increased uncertainty disclosure will help decision-makers to make more informed decisions, and thereby prevent potential environmental degradation during imminent energy development projects. By drawing more attention to the communication processes within EA, and presenting possible weaknesses that could be remedied for future assessments, this study is beneficial to practitioners and decision-makers who participated in the Joslyn North EA process.

A standardized process of assessing common uncertainties in energy development project would render the process more transparent by making it clearer to understand for most stakeholders involved. Transparency and accuracy of information would also be improved by proper training of regulatory staff on reading policy, legislation, and technical reviews.

The use of professional judgment in the Alberta Approval System is unavoidable. Too much professional judgment in EA, however, can inadvertently discount uncertainties that may be important to other stakeholders, if not actually create uncertainties by using professional judgment in lieu of scientific data. EA parties must try to distance themselves from their values when making decisions (i.e., try not to use as much value-heavy judgment) in order to reassess uncertainty communication in energy development EA. Alternately, if professional judgment is used on the regulatory and industrial side of the EA and within the EIS, then cultural, traditional, and spiritual judgment and experiences must carry equal weight.

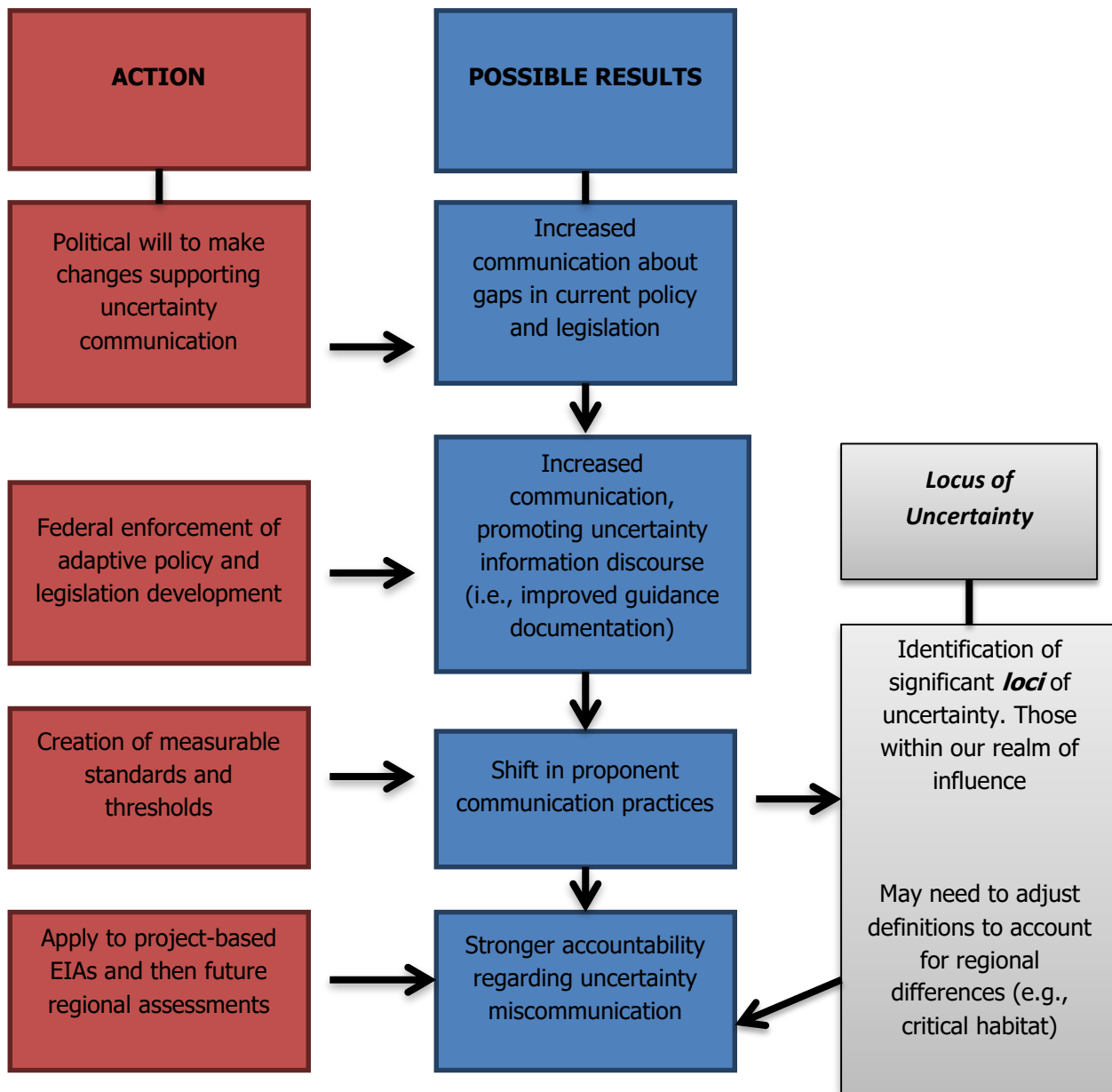
#### *6.2.4 Recommendations to Improve Uncertainty-Related Legislation, Regulations, and Guidance*

This research builds on findings by Leung et al., (2015), who suggest that EA research should focus on the development of frameworks to provide both conceptual and practical guidance

for decision-makers on interpreting and using information. Much research has been completed on predictive capabilities and assumptions in models for example (see Duncan, 2008; Harremoës, 2003; Gabbert et al., 2010; Sigel et al., 2010; Maier et al., 2008; Walker et al., 2003; Wardekker et al., 2008), but specific *loci* in the realm of influence for EA stakeholders need to be investigated. Uncertainties created from improper policy management, legislation, and regulatory requirements have been largely overlooked. For example, policies related to data collection or to improving baseline information for model inputs might lead to a more upfront communication and assessment of uncertainty, regulations regarding more stringent wording and definitions (e.g., appropriately defining critical habitat for species at risk and other wildlife). Similarly, completing a deductive assessment (i.e., understand the more general *loci* of uncertainty and then narrow down to the specifics) of specific *loci* of uncertainties can give decision-makers criteria to follow for future decisions.

Currently uncertainty guidance is complex, theoretical, and includes few real world applications (see Duncan, 2013; Leung et al., 2016; Tennøy et al., 2006; Wardekker et al., 2008). Implementing methods of assessing common *loci* of uncertainty (such as those found in oil sands EAs) can be a stepping-stone for uncertainty communication, disclosure, and consideration for EA in general. Again, the creation of a standardized process, including the development of appropriate definitions and criteria for important measurables (i.e., critical habitat), would mean that EA stakeholders might positively influence internal locations where uncertainty exists, regardless of the source or type.

Uncertainty will never be completely absent. Small changes though, such as filling in gaps of baseline data through proper legislation (e.g., adding information about what critical habitat exists), would give EA professionals a chance to weed out existing uncertainties in their realm of influence. Figure 6.1 demonstrates how small changes applied to the EA process can illuminate uncertainties during EIS development and project approval decision-making. The more *loci* of uncertainty that come to light, the more readily they can be targeted for remediation. Completing deductive assessment of specific *loci* of uncertainties can give decision-makers criteria to follow for the future.



**Figure 6.1:** Suggested actions to promote uncertainty disclosure, communication, and consideration.

#### 6.2.5 Suggested Future Research For More Case Studies And Comparisons Among Countries

Further research should be undertaken to assess the contextual dynamics of large-scale projects, like the Joslyn North mine or other energy development projects. Though inadequate federal definitions, policy, legislation, and criteria were subjects that brought uncertainty to the Joslyn North case, other contextual dynamics (e.g., difference relationships between stakeholders, variations in inter-government regulations and so on) that exist could be used by EA professionals

to identify significant *loci* of uncertainty for large-scale energy projects. As well, a multi-stakeholder technical committee comprised of representatives from industry, government, Aboriginals, academics, and practitioners should develop a process for review of the development of standards for assessing uncertainty. These standards can be applied regionally at first, and then taken as a skeleton framework to be applied nationally, adapting them to individual projects.

Finally, more case studies on large-scale projects need to be completed from the academic side. In this way, more *loci of uncertainty* can be identified and compared across projects and perhaps even countries.

### 6.3 FINAL REMARKS

This research has laid groundwork upon which more detailed research can be undertaken in an attempt to improve uncertainty communication and consideration selection in Canadian EA and EA more generally. In particular, the first step to improved uncertainty consideration is for proponents and government to be more upfront regarding decisions that require some trade-offs (e.g. setback distances being traded off for increased resource recovery). These decisions should include citizen involvement, and not be fragmented or be proprietary information. Next, since the current structure in EA has a reductionist approach by taking complex situations and reducing them to better understand them, therefore, the idea of reducing further uncertainties to understand which are within the realm of stakeholder influence should be manageable. Focus on the uncertainties that can be addressed is required to improve the efficacy of Canadian EA practice and in the broader field of impact assessment.

Even though proponents may be “absolutely terrified of using the [phrase] ‘significant adverse effect’... This [reluctance] has done a lot of damage to the impact assessment process because people won’t call a spade a spade,” as noted by the panel member. These Joslyn North results show that stakeholders prefer honesty, which is not always a precursor to project disapproval. Transparency, improved communication, provision of accurate uncertainty information - all create avenues for future discussion that may bear only passing resemblance to the EA processes of the past.



## Chapter Seven

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## APPENDIX A

### Research Fact Sheet



#### **How Context Affects Uncertainty Disclosure and Communication in Environmental Impact Assessment: A Study of Energy Development in Northern Alberta**

*A research project funded by the Social Sciences and Humanities Research Council of Canada*

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##### **Research Problem:**

Decision-makers use environmental impact assessment (EIA) as a tool to identify and evaluate the potential environmental impacts of proposed developments. Since EIA is used to predict the future, some uncertainty is inherent and unavoidable; however, uncertainty is not always considered or communicated. There has been no research on the contextual dynamics of uncertainty consideration and acknowledgement in Canadian EIA; therefore, the purpose of this

study is to investigate practices of uncertainty consideration, avoidance, and disclosure in Canadian EIA within the context of social, political, economic and/or environmental project conditions. The research will examine individual differences regarding both the perception of uncertainty, and the complexity and dynamics of the decision-maker's environment. The focus for the investigation will be a case study of the Joslyn North Oil Sands Mine in Northeastern Alberta. This research is guided by the need to understand the relationships (i.e., communication, cause and effect etc.) and events that take place among the decision-makers in the energy development industry. The overall intent of the case investigation is to advance and improve understanding of uncertainty consideration and communication to help prevent environmental degradation during imminent energy development projects. This research is part of a larger Social Science and Humanities Research Council (SSHRC) funded initiative developed to advance the theoretical understanding and explanation of uncertainty in EIA, to bring uncertainty to the forefront of practice, and to pose practical solutions to improve uncertainty assimilation, communication, and transparency.

**The specific objectives of this research are the following:**

- Document uncertainty disclosure, consideration, and avoidance behaviour practices within the context of a single project-based environmental impact assessment;
- Investigate how contextual factors for project development (environmental, social, political, administrative) may or may not have contributed to uncertainty disclosure, consideration, and avoidance practices; and,
- Develop recommendations about how uncertainty can be more readily acknowledged, considered and communicated in EIA practice and decision-making.

**This research involves the following phases:**

**1) Phase 1. Ongoing:**

Document review: examination of the Joslyn North Mine environmental impact statement (EIS), the proponent's filing, the panel's decision documents with recommendations, and the panel review summary.

- *Status*: Preliminary document review is being completed, providing background information, historical insight and context on the issues at hand. The document review affords a foundation for the subsequent phase of research.

**2) Phase 2. May to June 2014 (upcoming):**

Semi-Structured interviews: Semi-structured interviews with stakeholders, i.e. proponents, practitioners, Aboriginals regulators, decision-makers, interveners, and members of the review panel that were directly involved with the Joslyn North Mine project, will be conducted.



Approximately 25-30 interviews will be scheduled; each approximately 45-60 minutes in length. The intent is to discuss the viewpoints and experiences of the stakeholders involved in the Joslyn North Mine project-based EIA process regarding uncertainty communication.

- *Status:* You are being asked to participate in this phase of the research. Specifically, I am asking you to grant an interview about your experiences with uncertainty communication in the context of the Joslyn North Mine project-based EIA.

**Expected contributions are the following:**

- Develop recommendations for the international environmental impact assessment (EIA) community about how uncertainty can be more readily acknowledged, considered and communicated in (EIA);
- Benefit practitioners and decision-makers that participated in the Joslyn North Mine EIA by drawing more attention to the communication processes within EIA and presenting possible weaknesses that could be remedied for future assessments;
- Contribute to the development of best guidance for uncertainty communication to aid practitioner communities in Canada, particularly those who are active in EIA policy, decision-making, environmental management and energy development; and,
- Though the above benefits are expected, it is important to stress that these benefits are not necessarily assured.

**Expected research products are the following:**

- A masters thesis reporting scientific results of the investigation; and,
- One or more research articles based on the thesis will be published in international, peer-reviewed environmental assessment and/or policy and planning periodicals.

## **APPENDIX B**

### **Initial Contact Email**

Dear X,

My name is Claire Crowley and I am a M.Sc. candidate in the Department of Geography and Planning at the University of Saskatchewan. I am currently writing my Masters dissertation on uncertainty practices within a single project based Environmental Impact Assessment (EIA) – the Joslyn North Oil Sands Mine (JNM). The aim of the dissertation is to understand the relationships (i.e., communication, cause and effect etc.) and events that take place among the decision-makers in the energy development industry. My hope is that the results of my dissertation can be fed back into EIA practice for more efficient EIA practices in the energy development sectors.

I have read the Environmental Statement for the JNM, but I would like to further my understanding through some questions. This would include an interview of about 45 – 60 minutes in length, where I shall ask questions about your views on uncertainty within the single project based EIA. As one of the key stakeholders in the JNM project, your views, knowledge and experiences would be extremely valuable to my study.

You will be anonymous, and all data will be handled securely and discreetly by myself only.

I fully appreciate that you are very busy, though I would be most grateful if you could spare an hour of your time for my study. Please feel free to contact me with any questions.

I look forward to your comments.

Sincerely,

Claire K. Crowley

## APPENDIX C

### Participant Consent Form



#### PARTICIPANT CONSENT FORM

#### **How Context Affects Uncertainty Disclosure and Communication in Environmental Impact Assessment: A Study of Energy Development in Northern Alberta**

*A research project funded by the Social Sciences and Humanities Research Council of Canada (SSHRC)*

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**Procedures:**

- Approximately 25-30 interviews will be conducted; each will be approximately 40-60 minutes in length.
- The interview will ideally take place in an area with little distraction, and that is comfortable for you.
- Interviews will be recorded using a digital recording device, and notes will be taken during the interview by the primary investigator.
- Please feel free to ask any questions regarding the procedures and goals of the study or your role.

**Potential Risks:**

- You are encouraged to only answer those questions that you are comfortable with, in a manner that you are comfortable with; this is to avoid any discomfort that you may feel.

### **Potential Benefits:**

- Develop recommendations for the international environmental impact assessment (EIA) community about how uncertainty can be more readily acknowledged, considered and communicated in (EIA).
- Benefit practitioners and decision-makers that participated in the Joslyn North Mine EIA by drawing more attention to the communication processes within EIA and presenting possible weaknesses that could be remedied for future assessments.
- Contribute to the development of best guidance for uncertainty communication to aid practitioner communities in Canada, particularly those who are active in EIA policy, decision-making, environmental management and energy development.
- Though the above benefits are expected, it is important to stress that these benefits are not necessarily assured.

### **Confidentiality:**

- Names and personal information will be kept confidential and not published in any of the results from this study; personal information will only be seen by the primary investigator/supervisor.
- Although the data from this research project will be published and presented at conferences, the data will be reported in an aggregated fashion, such that it will not be possible to identify individuals. Moreover, the Consent Forms will be stored separately from the recordings and notes, so that it will not be possible to associate a name with any given set of responses.
- Because the participants for this research project have been selected from a small group of people, all of whom are known to each other, it is possible that you may be identifiable to other people on the basis of what you have said. Even so, all reasonable efforts will be made to try to protect participants' anonymity.
- After the interview, and prior to the data being included in the final report, you will be given the opportunity to review the transcript of your interview, and to add, alter, or delete information from the transcripts as you see fit.
- A digital audio recording will be used during the interview to help with thorough data collection and to help with transcript creation.
- A master's thesis will be used to report scientific results of the investigation.
- One or more journal articles based on thesis, to be published in international, peer-reviewed environmental assessment and/or policy and planning periodicals.
- Direct quotations may be used in research dissemination.
- The data will be reported anonymously in an aggregated or summarized form.

**Storage of Data:**

- The data will be stored on the primary investigator's computer. When the data are no longer required, the data will be destroyed.
- There are several options for you to consider if you decide to take part in this research. You can choose all, some or none of them. Please place your initials on the corresponding line(s) that grants me your permission to:

I grant permission to be audio taped: Yes: \_\_\_\_ No: \_\_\_\_

I grant permission to have my organization's name used: Yes: \_\_\_\_ No: \_\_\_\_

I wish to remain anonymous: Yes: \_\_\_\_ No: \_\_\_\_

I wish to remain anonymous, but you may refer to me by an alias: Yes: \_\_\_\_ No: \_\_\_\_

The alias I choose for myself is: \_\_\_\_\_

You may quote me and use my name: Yes: \_\_\_\_ No: \_\_\_\_

**Right to Withdraw:**

- Your participation is voluntary and you can answer only those questions that you are comfortable with. You may withdraw from the research project for any reason, at any time without explanation or penalty of any sort.
- Should you wish to withdraw, all data that was recorded from your correspondence or participation will be deleted from the research project and destroyed, if desired.
- Your right to withdraw data from the study will apply until the results have been disseminated. After this date, it is possible that some form of research dissemination will have already occurred and it may not be possible to withdraw your data.
- Because this research project extends over a significant length of time, you will be advised of any new information that could have a bearing on their decision to participate, as well, informed about the process by which ongoing consent will be sought.
- If appropriate, the researcher may choose to discontinue a participant's involvement in the study, in which case his/her data will be deleted from the research project and destroyed.

**Follow up:**

- To obtain results from the study, please contact the primary researcher to request the master's thesis or scientific paper to be published.

**Questions or Concerns:**

- Contact the researcher(s) using the information at the top of page 1;
- This project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board on September 17<sup>th</sup>, 2013.

- This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office [ethics.office@usask.ca](mailto:ethics.office@usask.ca) (306) 966-2975. Out of town participants may call toll free 1 (888) 966-2975.

**Consent:**

Your signature below indicates that you have read and understand the description provided.

“In signing, I agree I have had an opportunity to ask questions and my/our questions have been answered. I consent to participate in the research project. A copy of this Consent Form has been given to me for my records.”

_____	_____	_____
<i>Name of Participant</i>	<i>Signature</i>	<i>Date</i>
_____	_____	
<i>Researcher's Signature</i>	<i>Date</i>	

***A copy of this consent will be left with you, and a copy will be retained by the researcher.***

## APPENDIX D

### Interview Schedules

#### Speak no evil, hear no evil? Uncertainty analysis and communication in Canadian environmental impact assessment practice and decision-making

##### STAKEHOLDER Case Study Interview Guide

The interview guide presents the main themes and overall questions that will guide your interview process. You should tailor your questions to your specific case/project, the interviewee (e.g. regulator, ENGO, Aboriginals, etc.) and (if relevant) to the specific issue(s) you are addressing. For each interview, make sure to document the person's name, professional affiliation/organization, and the date and time of the interview.

QUESTIONS	EXPLANATIONS, PROBES & FOLLOW-UPS
<b>Introduction</b>	
1. What was your involvement or role in the project-based EIA process?	
<b>Theme 1: Uncertainty in the assessment</b>	
1. Can you recall some of the main uncertainties regarding the project development?	<b>Probe:</b> For example, in relation to the project's design, predicted impacts, how to manage them, etc.)
2. In your view, what factors contributed most to the creating the uncertainties you've mentioned?	<b>Probe:</b> For example, environmental, social, economic, political, scientific, or other factors?
3. Did uncertainties in the assessment affect your confidence in the EIA process or in the project decision (e.g. approval/recommendations)?	
<b>Theme 2: Communication of uncertainty</b>	
1. Based on your recollection, what was done during the assessment, if anything, to communicate uncertainties?	<b>Follow-up:</b> How were uncertainties communicated? By whom? To whom? Did you initiate any of these activities?
2. Was enough information about uncertainty shared, and were the right people involved?	<b>Follow-up:</b> If not, what would have been a better way?
3. During the EIA process (or hearing or decision process, etc), did you ever feel that you (or others involved) couldn't communicate openly about uncertainty for fear of some consequence?	<b>Probe:</b> Is there a particular example that you can share?
4. Was information about uncertainty used in the EIA process?	<b>Explanation:</b> In other words, did this information influence the way impacts were predicted, management measures, the project decision, etc.?

	<b>Probe:</b> Can you think of a particular example?
5. What would you have done differently to communicate about uncertainty, and with whom, if you had the opportunity?	<b>Probe:</b> Why? Can you explain?
<b>Theme 3: Perceptions of Uncertainty</b>	
1. What information about uncertainty is important to you?	<p><b>Explanation:</b> In other words, are there certain instances or issues, in general, where knowing about any uncertainties is of particular importance?</p> <p><b>Probe:</b> Why?</p>
2. Might you have responded differently or viewed the EIA or decision differently if you had more (or less) information about uncertainty in the EIS?	<b>Probe:</b> Why? Can you explain?
3. Looking back on this project, what would you identify as the benefits to disclosing ( <i>or not disclosing</i> ) information about uncertainties to the affected interests ( <i>e.g. proponent, decision maker, aboriginals, public</i> )?	<p><b>Follow-up:</b> Were there any negative outcomes or risks created because uncertainties were reported (or not reported)?</p> <p><b>Follow-up:</b> More generally speaking, beyond this particular project, what are the benefits of disclosing (<i>or not</i>) uncertainties? The risks?</p> <p><b>[Probe – benefits and risks to proponent, decision maker, Aboriginal communities, ENGOs, public]</b></p>
4. As a stakeholder, you are involved in the communication about uncertainty during the EIA process. How do you think other stakeholders view your approach to handling uncertainty?	<p><b>Probe:</b> For example do they think you intentionally hide uncertainty, would use it to delay the project etc? <i>[use examples as applicable to the interviewee]</i></p> <p><b>Follow-up:</b> How do you think other stakeholders (<i>e.g. the proponent, regulators, ENGOs, etc</i>) view uncertainty in EIA, or would use information about uncertainty?</p>
5 How did the panel, decision makers, or other stakeholders react to or address any uncertainties that may have been presented during the EIA or in the EIS?	<b>Follow-up:</b> Was the response appropriate in your view?
<b>Theme 4: Gauging Uncertainty</b>	
1. Were you satisfied with the way uncertainties were dealt with (i.e. communicated and considered in project management and decisions)?	<p><b>Probe:</b> Why or why not?</p> <p><b>Follow-up:</b> Do you think the other stakeholders were aware of and satisfied with how uncertainties were communicated?</p> <p><b>[Probe – Why or why not]</b></p>



2. Would you say that there is a gap between the potential range of the project's effect that may occur in the long term, in combination with other projects, and the range of our knowledge or the responsibility taken for managing these effects?	<b>Follow-up:</b> How important is uncertainty communication to closing or at least understanding this gap?
<b>Theme 5: Suggestions for improved practice</b>	
1. What were/are the main challenges to communicating uncertainty in this project?	
2. Who is (or should be) ethically responsible for disclosing uncertainty in an EIA?	<b>Follow-up:</b> Are there (or should there be) legal obligations to do so?
3. What could, or should, panel members or decision makers do with information about uncertainties in an EIA when they do receive it?	
4. Is there a need to improve uncertainty communication in EIA?	<b>Probe:</b> Why or why not? <b>Follow-up:</b> Are there any aspects of uncertainty communication you think are done well?
5. What are your suggestions (if any) for how we can improve uncertainty communication in EIA?	
<b>Theme 6: Influence of context on uncertainty communication</b>	
1. Were there any particular factors related the project environment or dynamics that influenced how uncertainties around wildlife habitat connectivity were communicated during the EIA?	<b>Probe:</b> For example, the social or economic environment of the project? <b>Probe:</b> For example, relationships among project proponents and stakeholders? <b>Probe:</b> For example, the politics of the decision making process?
2. What uncertainties regarding species at risk and their critical habitat were communicated by the proponent during the assessment that you are aware of?	<b>Follow-up:</b> Were there any other uncertainties about species at risk you were aware of, that perhaps were not communicated by the proponent?
3. Were any uncertainties noted that were related to the mine's close proximity to the Ells River Valley?	<b>Probe:</b> If yes, do you think the habitat corridor that was deemed sufficient was appropriate given the uncertainties you just described?

<p><b>4.</b> Is there anything further the proponent could have done, or that you could have done, to address uncertainties about species at risk (e.g. fish, caribou) in the impact assessment processes?</p>	
<p><b>5.</b> Do you feel the panel gave due consideration to the uncertainties about species at risk when making their final decision and recommendations? Please explain your answer.</p>	<p><b>Follow-up:</b> If no, in your opinion, what could/should they have done differently to better consider uncertainties?</p>

## Speak no evil, hear no evil? Uncertainty analysis and communication in Canadian environmental impact assessment practice and decision-making

### PROPONENT Case Study Interview Guide

The interview guide presents the main themes and overall questions that will guide your interview process. You should tailor your questions to your specific case/project, the interviewee (e.g. regulator, practitioner, etc.) and (if relevant) to the specific issue(s) you are addressing. For each interview, make sure to document the person's name, professional affiliation/organization, and the date and time of the interview.

QUESTIONS	EXPLANATIONS, PROBES & FOLLOW-UPS
<b>Introduction</b>	
1. What was your specific role in the project-based EIA as a proponent/consultant?	
<b>Theme 1: Uncertainty in the assessment</b>	
1. Can you recall some of the main uncertainties regarding the project development?	<b>Probe:</b> For example, in relation to the project's design, predicted impacts, how to manage them, etc.)
2. In your view, what factors contributed most to the creating the uncertainties you've mentioned?	<b>Probe:</b> For example, environmental, social, economic, political, scientific, or other factors?
<b>Theme 2: Communication of uncertainty</b>	
1. What was done by the proponent to communicate uncertainties within the environmental impact statement, if anything?	<b>Follow-up:</b> Where and how was this done in the EIS?
2. What else was done by the proponent to communicate uncertainties throughout the environmental impact process, if anything?	<b>Follow-up:</b> How was this done? Who was the intended audience?
3. Do you feel that information provided about uncertainty reached your intended audience?	<b>Follow-up:</b> If not, what would have been a better way?
4. To your knowledge, did others apply the uncertainty information provided by the proponent in the EIA process?	<b>Probe:</b> Can you think of a particular example?
5. During the EIA process (or hearing or decision process, etc.), did you ever feel	<b>Probe:</b> Is there a particular example that you can share?

that you (or others involved) couldn't communicate openly about uncertainty for fear of some consequence?	
6. What would you have done differently to communicate about uncertainty, and with whom, if you had the opportunity?	<b>Probe:</b> Why? Can you explain?
<b>Theme 3: Perceptions of Uncertainty</b>	
1. What information about uncertainty is important to you, as a proponent/consultant?	<p><b>Explanation:</b> In other words, are there certain instances or issues, in general, where knowing about any uncertainties is of particular importance?</p> <p><b>Probe:</b> Why?</p>
2. Looking back on this project, what would you identify as the benefits to disclosing ( <i>or not disclosing</i> ) information about uncertainties to the affected interests ( <i>e.g. decision maker, aboriginals, public</i> )?	<p><b>Follow-up:</b> Were there any negative outcomes or risks created because uncertainties were reported (or not reported)?</p> <p><b>Follow-up:</b> More generally speaking, beyond this particular project, what are the benefits of disclosing (<i>or not</i>) uncertainties? The risks?</p> <p><b>[Probe – benefits and risks to proponent, decision maker, Aboriginal communities, ENGOs, public]</b></p>
3. As a proponent/consultant, part of your job is to communicate uncertainty during the EIA process. How do you think other stakeholders viewed your approach to handling uncertainty?	<p><b>Probe:</b> For example, do they think you intentionally hide uncertainty, or would use it to delay the project, etc.? <i>[use examples as applicable to the interviewee]</i></p> <p><b>Follow-up:</b> How do you think other stakeholders (<i>e.g. regulators, ENGOs, etc</i>) view uncertainty in EIA, or use information about uncertainty?</p>
4. How did the panel, decision makers, or other stakeholders react to or address the uncertainties that were presented during the EIA or in the EIS?	<b>Follow-up:</b> Were you surprised by these reactions in any way?
<b>Theme 4: Gauging Uncertainty</b>	
1. Would you say that there is a gap between the potential range of the project's effect that may occur in the long term, in combination with other projects, and the range of our knowledge or the responsibility taken for managing these effects?	<b>Follow-up:</b> How important is uncertainty communication to closing or at least understanding this gap?
<b>Theme 5: Suggestions for improved practice</b>	
1. What were/are the main challenges to communicating uncertainty in this project?	

2. Do you feel project proponents should be ethically responsible for disclosing uncertainty in an EIA?	<b>Follow-up:</b> Are there (or should there be) legal obligations to do so?
3. What could, or should, panel members or decision makers do with information about uncertainties in an EIA when they do receive it?	
4. Is there a need to improve uncertainty communication in EIA?	<b>Probe:</b> Why or why not? <b>Follow-up:</b> Are there any aspects of uncertainty communication you think are done well?
5. What are your suggestions (if any) for how we can improve uncertainty communication in EIA?	
<b>Theme 6: Influence of context on uncertainty communication</b>	
1. Were there any particular factors related the project environment or dynamics that influenced how uncertainties around wildlife habitat connectivity were communicated during the EIA?	<b>Probe:</b> For example, the social or economic environment of the project? <b>Probe:</b> For example, relationships among project proponents, stakeholders and FN? <b>Probe:</b> For example, the politics of the decision making process?
2. What uncertainties regarding species at risk and their critical habitat were communicated during the assessment that you are aware of?	<b>Follow-up:</b> How was this done? Who was the intended audience?
3. Were any uncertainties noted that were related to the mine's close proximity to the Ells River Valley?	<b>Probe:</b> If yes, do you think the habitat corridor that was deemed sufficient was appropriate given the uncertainties you just described?
4. Do you feel satisfied with all that was done to address uncertainties about species at risk (e.g. fish, caribou) in the impact assessment processes?	<b>Follow-up:</b> Do you think other stakeholders (e.g. regulators, ENGOs, etc.) were satisfied with all that was done?
5. Do you feel the panel gave due consideration to the uncertainties about species at risk when making their final decision and recommendations? Please explain your answer.	